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SOURCESRESOURCES ABSTRACTS



VOLUME 6, NUMBER 12 JUNE 15, 1973 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 6, NUMBER 12 JUNE 15, 1973

W73-07151 -- W73-07800

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1973.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier, pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION

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09 MANPOWER, GRANTS, AND FACILITIES

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

STRUCTURAL MODEL FOR THE DIELECTRIC RELAXATION OF LIQUID WATER, National Inst. of Arthritis and Metabolic Diseases, Bethesda, Md.

A. P. Minton.

A. P. Minton. Nature, Vol 234, No 52, p 165-168, Dec 27, 1971. 2 fig. 17 ref.

Descriptors: "Water chemistry, "Polarity, "Water properties, "Water structure, Computer models, Equations, Input-output analysis, Hydrogen bonding, Molecular structure, Water temperature. Identifiers: "Dielectric relaxation.

Identifiers: *Dielectric relaxation.

A structural model is proposed for the polarization relaxation process in liquid water. The model is necessarily qualitative at this stage and perhaps imprecise in certain respects, but this very non-specificity allows many more observed properties of water to be accommodated within its framework. The basic structural concept underlying this model is that, although water molecules for the most part are hydrogen bonded to their neighbors, liquid water possesses no significant degree of lattice-like molecular arrangement because of the flexibility of the O-H-O bond. Even though this bond is flexible, at any given temperature there exists a certain equilibrium fraction of O-H groups which cannot be judged by any reasonable geometric or energetic criterion to participate in a hydrogen bond (dangling bonds). Clearly a hydrogen bonded O-H group is energically favored over a dangling OH, and one would expect any given molecule to seek the configuration of minimum potential within its local environment. An analogy can be made between a dangling OH and a localized excitation or crystalline point defect. (Woodard-USGS) ct. (Woodard-USGS)

02. WATER CYCLE

2A. General

DYNAMIC CONTRIBUTING AREA MODEL FOR RUNOFF ESTIMATION BASED ON STREAM NETWORK GEOMORPHOLOGY-A-PPLICATION TO SMALL INDIANA WATERSHEDS, Purdue Univ., Lafayette, Ind. Water Resources

Research Center.

M. Lee. PH.D. Thesis, 1972. 263 p, 59 fig, 19 tab, 124 ref, 3 append. OWRR-B-008-IND (11).

Descriptors: *Rainfall-Runoff relationships, *Surface runoff, *Soil physical properties, *Topography, *Drainage density, *Small watersheds, *Geomorphology, Hydrographs, Hyetographs, Base flow, Temperature, Drainage, Watersheds, Slopes, *Indiana.

This study consisted of three major parts: (1) the development of a computer oriented assembly and retrieval system for hydrologic and geomorphologic data for Indiana watersheds; (2) the formulation of a dynamic model of the area contributing to the watershed runoff; and (3) the development of a method of digital simulation of watershed behavior for estimating streamflow hydrographs. To accomplish this (1) the principal geomorphologic characteristics were quantified by analyzing the watershed planform; (2) an integrated model of the rainfall-runoff process was formulated by using the dynamic response area concept and a linear routing technique; and (3) the model parameters were correlated to geomorphologic, rainfall and climatologic characteristics. Based on the dynamic

area model and the linear routing technique, a runoff simulation model is proposed. The basic input
information required is: the rainfall hyetograph,
the base flow, the daily minimum temperature, the
soil index, and drainage and topographic maps.
The model regenerates the runoff hydrographs
within reasonable error limits. The model performance was compared with some of the other
methods currently used in engineering design to
evaluate its advantages and disadvantages.
W73-07169

STATE AND TRENDS IN HYDROLOGICAL FORECASTS, World Meteorological Organization, Geneva (Switzerland).
P. I. Miljukov.

In: Status and Trends of Research in Hydrology

Descriptors: "Hydrology, Forecasting, Economics, Methodology, Volume, Water levels, Electronic equipment, Water storage, River beds, Channels, Mathematical studies, Snowmelt, Ice, Computers, International Hydrological Decade, Mathematical models, Runoff, Statistical

Identifiers: World Meteorological Organization.

The World Meteorological Organization's activities in hydrological forecasting are summarized. From a methodological point of view the different types and main fundamental methods of hydrological forecasting are given. The program of the International Hydrological Decade is to promote development of hydrological forecasting methods on both physical and mathematical bases. For short-term forecasts and, especially, for creating and testing methods are evolving. River run-off forecasting methods are evolving. River run-off forecasts compiled from hydrometric information figured on the basis of computation of non-steady motion of water masses are being developed. Physical experiments to study elementary processes and the spatial variability of processes in a basin are important and their variability is accounted for by mathematical statistics. Statistics using reliability criteria are used to test methods The World Meteorological Organization's activiusing reliability criteria are used to test methods based on mathematical analysis of multi-factor phenomena. The effectiveness of hydrological phenomena. The effectiveness of hydrological forecasting is improved with technical facilities, especially establishment of automatic systems for collection and processing of hydrometeorological information. International collaboration is an essential factor for the development of both theory and practice in forecasting. Unification of forceasting methods and strengthening the international ties of hydrologists in the field are encouraged. (Jones-Wisconsin)

HYDROLOGICAL RESERVOIR DESIGN USING BASIC SYSTEMS THEORY TECHNIQUES, Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 04A.

AN INVESTIGATION OF HYDROLOGICAL ASPECTS OF WATER HARVESTING, Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 03B. W73-07425

SIMULATION OF WATER RESOURCES SYSTEMS WITH SPECIAL EMPHASIS ON GROUNDWATER.

Proceedings, July 9-14, 1972, Lincoln, Nebraska Nebraska Water Resources Research Institute and Civil Engineering Department, University of Nebraska. W. Viessman, Jr., editor. 303 p. 108 fig. 300 equ, 93 ref.

Descriptors: "Simulation analysis, "Groundwater, "Model studies, "Hydrologic systems, "Equations, "Analytical techniques, Computer programs, Rainfall-runoff relationships, Hydrographs, Isotropy, Aquifers, Analog models, Finite element analysis, Watersheds (Basins), Surface water, Flow, Rivers, Streams, Reservoirs, Physical properties, Systems analysis. Identifiers: "Finite difference techniques, Differential equations, Rayleigh-Ritz method.

ferential equations, Rayleigh-Ritz method.

Presented is a group of five articles which considers the mathematical simulation of various phases of hydrology, with particular emphasis placed upon groundwater. Detailed discussions of hydrologic modeling and simulation are presented. Rainfall-runoff models designed to produce runoff hydrographs and which can be used to predict the future behavior of hydrologic systems are described. Basic finite difference techniques as applied to groundwater problems involving isotropic aquifers are introduced to workers having no previous experience with numerical methods. Presented also are: a survey of analog modeling in outline form; a detailed formulation of finite element analysis relating to subsurface fluid flow, using the Rayleigh-Ritz procedure; and a highly detailed, comprehensive report of simulation model construction, operation, and application to practical problems, including surface water routing models, the Muskingum and finite different methods, watershed, flood plain and kinematic wave models, and applications to existing waterways in North and South America. (See W73-07432)

HYDROLOGIC SYSTEMS, Nebraska Univ., Lincoln. Water Resources

Research Inst

Research Inst.
W. Viessman, Jr.
In: Simulation of Water Resources Systems with
Special Emphasis on Groundwater, Proceedings
July 9-14, 1972, Lincoln, Nebraska, Nebraska
Water Resources Research Institute and Civil Engineering Department, University of Nebraska. 7
fig, 26 equ, 26 ref, 20 p.

Descriptors: "Hydrologic systems, "Model studies, "Simulation analysis, "Surface water, "Rainfall-runoff relationships, Hydrologic data, Hydrologic cycle, Precipitation, Atmosphere, Evaporation, Continuity equation, Reservoirs, Groundwater, Watersheds (Basins).

Hydrology deals with the perpetual cycle of water movement from the oceans to the atmosphere to the land, etc. As competition for water resources movement from the oceans to the atmosphere to the land, etc. As competition for water resources grows, it becomes necessary to understand thoroughly the underlying hydrologic processes; major significance must be given the need for data relating to the maximum capacities of rivers and underground reservoirs. Significant forms of hydrologic data are listed, and the equation of continuity as related to the hydrologic water movement cycle is given; an example watershed precipitation problem is posed and solved. A detailed discussion of hydrologic modeling and simulation is presented. Surface water aspects of the hydrologic system are emphasized; rainfall-runoff models designed to produce runoff hydrographs and which can be used to predict the future behavior of hydrologic systems are highly nonlinear, time invariant, lumped models, although actual hydrologic systems are highly nonlinear, time-variant and spatially distributed. Several approaches to hydrologic modeling include the unit hydrograph method, correlation analysis, simulation, and nonlinear analysis. (See also W73-07432) (Bell-Cornell)

Group 2A-General

AN INTRODUCTION TO FINITE DIFFERENCE METHODS AS APPLIED TO GROUNDWATER PROBLEMS.

Nebraska Univ., Lincoln. Dept. of Geology. P. W. Huntoon.

P. W. Huntoon.
In: Simulation of Water Resources Systems with
Special Emphasis on Groundwater, Proceedings
July 9-14, 1972, Lincoln, Nebraska, Nebraska
Water Resources Research Institute and Civil Engineering Department, University of Nebraska. 39
fig, 70 equ, 17 ref, 99 p.

Descriptors: "Hydrogeology, "Numerical analysis, "Groundwater resources," Aquifers, Isotropy, Computer programs, Equations, Hydrologic systems, Model studies, Systems analysis. systems, Model studies, Systems and Identifiers: *Finite difference technic

Hydrogeology is concerned primarily with the oc-currence, movement, and quality of groundwater. Because of the critical social need for water and the heavy demands made on existing limited groundwater supplies, hydrogeology has evolved as a highly quantitative science. A primary func-tion of the hydrogeologist is to develop physically sound dynamic descriptions (models) of the hydrologic systems in which groundwater is found. Finite difference methods offer a powerful tool for treating complex hydrologic problems. These methods involve tremendous amounts of computations and were impractical until the recent ances memors involve tremendous amounts of computations and were impractical until the recent advent of high-speed computers. The fundamentals of this approach are easily grasped by workers with an introductory background in mathematics through differential equations; the methods may be applied successfully by scientists and engineers without extensive additional trainer. He fortiwithout extensive additional training. Unfortu-nately, there is a dearth of elementary texts on the subject. This monograph introduces basic finite difference techniques as applied to groundwater difference techniques as applied to groundwater problems involving isotropic aquifers to workers having no previous experience with numerical methods. The objectives are: (1) to provide the reader with a solid feel for the subject; (2) to impart sufficient technical capability for successful application of the method to a wide range of practical problems; and (3) to provide sufficient background for comprehension of the literature on the subject. (See also W73-07432) (Bell-Cornell) W73-07434

ANALOG MODELS, Nebraska Soil and Water Conservation Commis-

sion, Lincoln.

R. E. Waddington.
In: Simulation of Water Resources Systems with Special Emphasis on Groundwater, Proceedings July 9-14, 1972, Lincoln, Nebraska, Nebraska Water Resources Research Institute and Civil Engineering Department, University of Nebraska. 1 fig. 7 equ, 7 p.

Descriptors: *Analog models, *Analog computers, *Groundwater, *Aquifers, Physical properties, Simulation analysis, Mathematical models, Systems analysis, *Nebraska.

Identifiers: *Finite difference techniques, Butte

County (Neb.).

A survey of analog modeling is presented in out-line form, with particular attention paid to ground-water. Dealt with first are the developmental histo-ry, construction, and operation of analog models; included here are scale factors relating hydraulic parameters to electrical, definition of boundary conditions, and steady and non-steady state condi-tions. On the theoretical side, detailed finite-diftions. On the theoretical side, detailed finite-dif-ference solutions are presented, including reference to the laws of Darcy and Kirchoff. Then the methodology used for and the results of an ex-ample model-box of Butte County, Nebraska groundwater supply are outlined, as are the ad-vantages and disadvantages of analog models. (See also W73-07432) (Bell-Cornell) W73-07435

FINITE ELEMENT METHODS,

Nevada Univ., Reno. Desert Research Inst. R. L. Cooley. In: Simulation of Water Resources System

In: Simulation of Water Resources Systems with Special Emphasis on Groundwater, Proceedings July 9-14, 1972, Lincoln, Nebraska, Nebraska Water Resources Research Institute and Civil Engineering Department, University of Nebraska. 52 p, 6 fig, 113 equ, 35 ref.

Descriptors: "Finite element analysis, Equations, "Groundwater, "Subsurface flow, Hydraulics, Anisotropy, Steady flow, Unsteady flow, Regions, Systems analysis. Identifiers: "Rayleigh Ritz method, "Differential equations, Finite difference methods, Boundary conditions, Planes, Triangles.

Presented is a detailed formulation of finite element analysis, relating to subsurface fluid flow. The process of minimizing integrals to formulate the differential equations to be solved is a central problem of the calculus of variations. Another problem pertains to use of the minimized integral directly to formulate the solution to a boundary subsequently of the method of directly to formulate the solution to a boundary value problem such as equations. One method of doing this, the Rayleigh-Ritz method, concerns specification of a general function which sub-stituted into the minimized integral. This permits evaluation of the coefficients of the function so as evaluation of the coefficients of the function so as to give the best possible answer in terms of the specified function. This works well when the specified function. This works well when the general function is known and the region is not too complicated. Finite element analysis, which can handle very complicated regions accomplishes this process approximately by dividing the region into a number of elements small enough to enable specification of a simple approximating function for each. The Rayleigh-fitz procedure is applied to each element separately in such a way that hydraulic heads at nodes along the element boundaries are determined by solving a set of simultaneous equations with the heads as unknowns. Comparisons are made of finite difference and finite element procedures concerning basic under-Companisons are made of time unference and finite element procedures concerning basic underlying concepts, scope of problems possible to analyze, matrix properties, theoretical accuracy, and case of use. (See also W73-07432) (Bell-Cornell) W73-07436

SIMULATION OF GROUNDWATER SYSTEMS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. J. C. Schaake, Jr.

J. C. Schaake, Jr.
In: Simulation of Water Resources Systems with Special Emphasis on Groundwater, Proceedings July 9-14, 1972, Lincoln, Nebraska, Nebraska Water Resources Research Institute and Civil Engineering Department, University of Nebraska. 125 p, 55 fig, 84 equ, 15 ref.

Descriptors: *Simulation analysis, *Groundwater,
*Model studies, *Computer programs, *Equations, *Analytical techniques, Alternative
planning, Hydrologic systems, Watersheds uons, "Analyucal techniques, Alternauve planning, Hydrologic systems, Watersheds (Basins), Quifiers, Surface water, Rivers, Streams, Reservoirs, Steady flow, Unsteady flow, Urban runoff, Precipitation, Mathematical models, Systems analysis, Catchments, Hydrographs, Hydrologic data.

Identifiers: "Cumberland river, "Rio Colorado

(Argentina), *Rio Manati (Puerto Rico).

A comprehensive report of simulation model con-struction, operation, and application to practical problems is presented to demonstrate the practi-cality of simulation in the water resources field. cality of simulation in the water resources field. Simulation is defined, and its reasons for usage are discussed in detail. To aid in formulating the mathematical simulation model of a system, the several typical model components are identified and considered. A surface water routing model is defined as having the function to determine surface water hydrographs at different locations in a drainage network and the Muskingum method, the simplest of channel routing models for unsteady flow, is presented in detail. Three applications to existing waterways are described: (1) Cumberland River (finite difference method) (2) Rio Manati, Puerto Rico (flood plain model); and (3) Rio Colorado, Argentina, (kinematic wave model). Next, watershed models: an approach for modeling the direct runoff and streamflow process are presented; the model is then extended to include other hydrologic processes. How general hydrologic principles for catchment response to rainfall inputs can be used to create a computer model of a hypothetical catchment that responds to rainfall inputs according to these principles is model of a hypothetical catchment that responds to rainfall inputs according to these principles is explained. Dealt with further are structure of the detailed simulation model, and the Rio Colorado stream-aquifer, irrigation study, emphasizing groundwater. (See also W73-07432) (Bell-Cornell) W73-07432) groundwa... W73-07437

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COMPARISON OF RAINFALL-RUNOFF MODELS FOR URBAN BASINS,

MODELS FOR URBAN BASKS, Indian Inst. of Tech., Kappur. P. B. S. Sarma, J. W. Delleur, and A. R. Rao. (1971), 29 p, 6 fig, 2 tab, 10 equ, 21 ref. OWRR-B-002-IND (5).

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Watersheds (Basins), *Hydrologic data, Urban runoff, Model studies, Storms, Reservoirs, Storage, Hydrographs, Discharge (Water), Optimization, Simulation analysis, Operations

research. Identifiers: *Linear system models.

Reported is an investigation of the relative regeneration performance of some of the com-monly used linear hydrologic system models in an monly used linear hydrologic system models in an attempt to select an appropriate model to simulate the rainfall-runoff process in a given urban watershed. The relative regeneration performances of five linear rainfall excess-direct runoff models are compared for several urban watersheds with varying degrees of development. The five models considered are the single linear reservoir, the Nash model, the double routing method the linear channel-linear reservoir model. method, the linear channel-linear reservoir model, and the instantaneous unit hydrograph (IUH) obtained by the Fourier transform method. The IUH always gives the best regeneration performance among the four conceptual models tested. The opimized single linear reservoir constant differs from the theoretical time lag value, but is related to the latter, and for each watershed varies from storm to storm. For larger watersheds the Nash model gives the best regeneration performance among the four models tested. The model parameamong me rour models tested. The model parame-ters for each watershed are found to vary from storm to storm. The quality of regeneration for larger basins is less than that found for the smaller basins. (Bell-Cornell) W73-07439

THE INFLUENCE OF VALLEY GRAVELS ON THE MOVEMENT OF A FLOOD WAVE, Hydraulics Research Station, Wallingford (En-

gland). For primary bibliographic entry see Field 02J. W73-07525

STOCHASTIC ANALYSIS OF HYDROLOGIC

SYSTEMS, Illinois Univ., Urbana. Hydrosystems Lab.

Inmois Univ., Orona. Pydrosystems Lao.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 265-271, 1972 (release date). 11 ref.

scriptors: *Stochastic processes, analysis, *Flood forecasting, Water yield, Flood frequency, Planning, Simulation analysis, Mathe-matical models, Statistics, Probability.

Snow, Ice, and Frost-Group 2C

Complex hydrologic phenomena can be analyzed by the concept of stochastic systems. Based on this concept, a general stochastic hydrologic equation is developed and proposed for stochastic analysis of hydrologic systems. To illustrate the application of this approach, two stochastic hydrologic systems models for drainage basins are described; namely, a basin yield model and an annual flood model. The results of the analyses indicate the practical possibility of such analyses. (Knapp-USGS)

2B. Precipitation

INTERCEPTION AND PHYTOMORPHOLOGY REPORT ON PROJECT HO/HY/6 AND

HO(HY/), Ministry of Works, Wellington (New Zealand). Water and Soil Conservation Div. For primary bibliographic entry see Field 04A. W73-07280

CUMULUS CLOUDS AND THEIR MODIFICA-

TION, National Oceanic and Atmospheric Administra-tion, Coral Gables, Fla. Experimental Meteorology Lab.
For primary bibliographic entry see Field 03B.
W73-07386

STUDIES OF THE RAIN CYCLES OF WARM

CUMULI,
Weather Science, Inc., Norman, Okla.
J. L. Sutherland, and D. R. Booker.
Available from NTIS, Springfield, Va 22151 as
AD-750 889 Price 33.00 printed copy; 95 cents
microfiche. Air Force Cambridge Research
Laboratories Report 72-0350 (Scientific Report No
2), June 15, 1972. 29 p, 9 fig, 3 tab, 7 ref. Contract
No F19628-70-C-0228.

Descriptors: *Cloud seeding, *Rainfall, *Artificial precipitation, *Cloud physics, *Florida, Ureas, Methodology, Aircraft, Data collections, Correlation analysis, Nucleation.
Identifiers: Warm cumuli, Rain cycles.

During September 1971, a field experiment was held near Patrick Air Force Base, Florida, to study the life cycles of natural and hygroscopically seeded warm tropical cumuli. Measurements of rain were made at the cloud base with the reaffected rain appears to be initially visible from seven to ten minutes after seeding. The seeding efseven to ten minutes after securing. The seeding effects take the form of an increase in the concentration of large drops and an increase in the duration of the seeded showers. Comparisons were made between the RR40 and the Joss and Waldvogel ground-based raindrop distrometer. Also, the NCAR optical flowmeter was mounted on the WSI intentity to expert the security of the security NCAR optical flowmeter was mounted on the WSI aircraft to provide a comparison of rainwater contents measured by the RR40 and the optical flowmeter. In addition, formation flights in rain were flown by the AFCRL C-130 and the WSI aircraft to obtain further comparison data between the RR40, optical flowmeter, and the AFCRL light scattering raindrop spectrometer. (Woodard-USGS) HISCIS)

N

ATMOSPHERIC MOISTURE EXTRACTION
OVER THE OCEAN,
Lamont-Doherty Geological Observatory,
Palisades, N.Y.
For primary bibliographic entry see Field 02L.
W73-07397

TURBULENCE IN SHALLOW WATER FLOW UNDER RAINFALL, Purdue Univ., Lafayette, Ind. School of Civil EnFor primary bibliographic entry see Field 02E. W73-07404

HYDROLOGIC SYSTEMS, Nebraska Univ., Lincoln. Water Resources Research Inst. ary bibliographic entry see Field 02A For primar W73-07433

THE INFLUENCE OF TROPICAL EAST PACIFIC OCEAN TEMPERATURES ON THE ATMOSPHERE, British Meteorological Office, Bracknell (En-

Quarterly Journal of the Royal Meteorological Society, Vol 98, p 290-321, 1972. 21 fig, 6 tab, 38

Descriptors: "Temperature, "Pacific Ocean, "At-mosphere, Climatology, Tropical regions, Heated water, Precipitation (Atmospherie), Distribution patterns, Statistical methods. Identifiers: Tropical rains, Temperature currents

A version of the nine-level hemispheric model of the atmosphere developed at the Geophysical Fluid Dynamics Laboratory has been used to test Bjerknes' hypothesis that fluctuations of ocean temperatures in the tropical east Pacific are onsible for major variations in the position and intensity of the Aleutian surface low. The results of four 30-day integrations, two with warm and two with cool tropical east Pacific (maxiumum differences 3.5 C) are analysed, and verified against observational data. The ocean variations had important effects on the model atmosphere. both tropical and extra-tropical. The warmed ocean heated the air above and induced a surface low near the sea temperature maximum; as sociated low-level convergence and ascent gave increased tropical rainfall over the central and east Pacific with decreases over the west Pacific and parts of South America. The related upper flow changes generated a subtropical jet maximum with persistent troughing to the north over the mid-latitude east Pacific. (Oleszkiewicz - Vanderbilt) W73-07492

EXTENDED INDUSTRIAL REVOLUTION AND

CLIMATE CHANGE, Case Western Reserve Univ., Cleveland, Ohio. W. R. Frisken. EOS Transactions American Geophysical Union, Vol 52, No 7, p 500-507, July 1971, 2 fig. 26 ref.

Descriptors: *Climatology, *Temperature, *Solar radiation, Air pollution, Aerosols, Climates, Model studies, Energy conversion, Energy budget, Heat transfer.

As it became evident that human activities are capable of changing climate, the need arose for evaluation of these alterations. Fundamentals of climatology are presented with particular empha-sis on temperature and solar radiation as the most important factors in climate studies. Models of the atmosphere are presented. Factors of most importance to the temperature distribution are atmospheric pollutants, aerosols, water vapor (SST influence), carbon dioxide and heat from man's energy conversion. Most of the work in this field indicates that the latter will become in the long term future one of the more serious problem resulting in a process of continuous warming of the climate. If the energy conversion rate con-tinues to double every 17.5 years, in about 250 years it will equal the rate at which we absorb solar radiation at the earth's surface at the present time. (Oleszkiewicz - Vanderbilt)

ANNOTATED BIBLIOGRAPHY ON WEATHER MODIFICATION, 1960-1969, National Oceanic and Atmospheric Administra-tion, Rockville, Md. Environmental Science Infor-mation Center. ary bibliographic entry see Field 03B. W73-07544

SNOWFALL PROPERTIES OF LAKE ERIE AND ONTARIO STORMS, State Univ. of New York, Albany. For primary bibliographic entry see Field 02C. W73-07659

PROBABILITIES OF EXTREME SNOWFALLS AND SNOW DEPTHS, National Weather Service, New Brunswick, N.J. For primary bibliographic entry see Field 02C.

FROZEN PRECIPITATION-ITS FREQUENCY AND ASOCIATED TEMPERATURES, Cold Regions Research and Engineering Lab., Hanover, N. H. For primary bibliographic entry see Field 02C. W73-07664

THE PARAMETERIZATION AND PREDICTION OF SYNOPTIC-SCALE INFLUENCES ON GREAT LAKES SNOWSTORMS, State Univ. of New York, Albany. Dept. of Atheric Sciences. D. A. Paine, and M. L. Kaplan.

In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publica-tion, Vol 16, p 81-94, 1971. 15 fig, 7 ref. NOAA Grant No E22-49-70.

Descriptors: *Storms, *Great Lakes, *Snowfall, *Climatology, *Meteorology, Synoptic analysis, Precipitation (Atmospheric), Snow cover, Weather, Great Lakes region, Lake Erie, Lake Identifiers: *Snowstorms

A medium scale trough deep cyclonic systems A medium scale trough deep cyclonic systems plays an important role in the more severe mesocale lake-effect snowstorms. The trough's associated upward increase of positive vorticity advection provides organized ascent from 1 cm to 6 cm per sec below 600 mb. This upward motion apparess capacities cloud grouth by destabilizing enhances convective cloud growth by destabilizing the layer toward the moist adiabatic lapse rate. Prediction of this trough's movement and an ap-proximation of its subsequent upward vertical mo-tion field is determined by the pattern of positive vorticity advection on the 850 mb surface. This forecast employs an equivalent barotropic model near the feature's nondivergent level with a grid spacing of 127 km utilized to produce a 6, 12, 18, 24 and 30 hr prognosis. The predicted ascent correlates with maximum snowfall rates to the lee of both Erie and Ontario. Of equal value, the orienta-tion of predicted longest lake fetch shows good correspondence to observed zones of heaviest correspondence to observed zones of neavest snowfall. This guidance is superior to the forecast product provided by either the standard 381 km barotropic and primitive equation models, or information gained from analyzing 3-hourly surface sectional charts. (Knapp-USGS)

2C. Snow, Ice, and Frost

MANAGEMENT OF WINDBLOWN ALPINE SNOWS, Colorado State Univ., Fort Collins. Dept. of At-mospheric Science. S. Santeford, Jr.

Group 2C-Snow, Ice, and Frost

Atmospheric Science Paper No 192, December 1972. 182 p, 30 fig, 13 tab, 41 ref, 3 append. OWRR-Bi073-COLO (1).

Descriptors: *Alpine, *Snow management, *Snow cornice, *Water conservation, Runoff, *Hydrologic budget, Water storage, *Cirques, Snow cover, Sublimation, Evaporation, Precipitation (Avecuation)

tion (Atmospheric).

The runoff from alpine cirques can be successfully augmented by periodic blasting of the windblown ridgeline snow deposits into ciriues. Water-budget analyses of the alpine feeder area indicate that nearly 80 percent of the seasonal precipitation is transported out of the region. Only 23 per cent of this total transport (18% of seasonal precipitation) is caught in the natural cornice deposits along the ridgeline. The remaining 77 per cent of the transport is believed to sublimate from both the in-place anow cover in the alpine as well as during transport over the ridgeline. Cornices are an inefficient place to store windblown snow. Less than one-third of the winter storage in these ridgeline deposits is realized as runoff. The remaining two-thirds is lost to either evapo-sublimation or late melt occurring after runoff cirque ceases. Cirque water-budget analyses show that nearly 75 percent of the water stored in the cirques during the winter period is realized as runoff during the melt period, an increase of approximately 240 acre-feet of runoff per mile of ridgeline treated, at a cost of approximately \$50 per acre-rost discharged from the cirques. cirques. W73-07151

GLACIER SURVEYS IN ALBERTA, Department of the Environment, Ottawa (On-tario). Water Resources Branch.

I. A. Reid, and J. O. G. Charbonneau.
Report Series No 22, 1972. 19 p., 6 fig., 12 tab.

Descriptors: *Glaciohydrology, *Water resources, *Glaciers, *Melt water, *Canada, Snowmelt, Ice, Thawing, Water equivalent, Runoff, Surveys, Mapping, Analytical techniques, Aerial photography, Photogrammetry, Data collections, *Table 1. raphy, Photos Hydrologic data

The history of glacier surveys conducted in Canada by the Water Survey of Canada is summarized and present glacier survey practices are described. Tables of results, some interpretation of these results, and the most recent glacier maps are included. Because glaiers form part of Canada's water resources, some glaciers are surveyed on a continuing basis in an effort to determine the extent and pattern of a glacier's influence on surface water runoff. Of the large number of glaciers in Canada, only a small sample is surveyed. In an effort to increase the areal coverage of the glaciers surveyed, an aerial photogrammetric survey of the Athabasca Glacier was undertaken as a pilot project in July 1959. Permanent survey plugs were established around the perimeter of the glacier and tied-in by means of a triangulation survey. From the aerial photographs, a topographic map was prepared using a high-precision plotter. The Athabasca Glacier was surveyed again in 1962 by aerial photogrammetry. (Woodard-USGS) are included. Because glaiers form part of USGS) W73-07232

OBSERVATIONS OF ICE MOTION AND IN-TERIOR FLOW FIELD DURING 1971 AIDJEX PILOT STUDY Washington Univ., Seattle. Dept. of Oceanog-

raphy.

J. L. Newton, and L. K. Coachman.

AIDJEX Bulletin No 18, Washington University Division of Marine Resources, p 5-30, February 1973. 19 fig, 6 tab, 7 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Arctic Ocean, *Sea ice, Winds, Currents (Water), Oceanography, Ice cover.

Identifiers: *AIDIEX study.

The interior flow field of the Arctic Ocean was studied to determine (1) how accurately Arctic Ocean currents can be estimated using geostrophic calculations, (2) the horizontal and vertical coherence of the flow field, and (3) the relationship between the ice motion and the interior flow field. The general circulation of the Arctic water in the Canadian Basin is in the form of a clockwise gyre. Long-term mean surface flow is 2.5-3.0 cm per see south. Geostrophically calculated current shears. Ice motion was governed by a combination of shears agreed with the measured current shears. Ice motion was governed by a combination of direct wind stress and sea surface alope. The Coriolis and pressure gradient forces were nearly equal and opposite. Wind stress and total resistance vector were also nearly equal and opposite, and approximately normal to the Coriolis force. Therefore, the ice motion generally moved water so as to build a surface slope up to the right of the motion, creating a pressure gradient which offset the tendency of the ice to turn due to Coriolis force, so that the resulting ice motion (and resistance) was more nearly in line with wind stress. (Knapp-USGS)

SOME SEASONAL VARIATIONS OF THE ICE COVER IN THE BEAUFORT SEA: EVIDENCE MACROSCALE DYNAMICS

PHENOMENA, National Environ Washington, D.C. nental Satellite Service,

Washington, D.C. R. J. DeRycke. AIDJEX Bulletin No 18, Washington University Division of Marine Resources, p 45-50, February 1973, 10 ref.

Descriptors: "Sea ice, "Ice cover, "Artic Ocean, Ice, Mapping, Aerial photography, Satellites (Artificial), Surveys, Oceanography, Remote sensing. Identifiers: "AIDJEX study, "Beaufort Sea.

Prominant features in the ice cover in the Beaufort Prominant features in the ice cover in the Beautort Sea were found using spacecraft-derived imagery. Repetitive seasonal changes were observed in data from the years 1969, 1970, and 1971. The ice cover changed from long north-south leads in the spring to giant floes (5-50 nautical miles) in early summer, and to increasingly smaller floes at about the time of autumnal freezeup. (Knapp-USGS)

MAPPING THE UNDERSIDE OF ARTIC SEA ICE BY BACKSCATTERED SOUND, Wisconsin Univ., Middleton. Geophysical and Polar Research Center. Folar Research Center.
J. M. Berkson, C. S. Clay, and T. K. Kan.
AIDJEX Bulletin No 18, Washington University
Division of Marine Resources, p. 51-59, February
1973. 3 fig, 13 ref. Contract N00014-67-A-0128-

Descriptors: *Sea ice, *Ice cover, *Sonar, *Artic Ocean, Aerial photography, Instrumentation, Sounding, Mapping, Surveys, Artic, Topography. Identifiers: *AIDJEX study, Ice roughness.

The undersurface of arctic sea ice was studied using a narrow-beam scanning sonar to measure the relative backscattering strengths at 48 kHz. the relative backscattering strengths at 48 kHz. The graphic records displaying the range and relative scattering levels were assembled into a sonar map that displays the location and shape of underice features. There are tow distinct types of backscattering; high-level backscattering from well-defined under-ice ridges and low-level backscattering from between the ridges. The higher scattering at the ridges is probably due to the increase in roughness and the tilting of the average plane of the scattering surface. Comparison of the sonar map and aerial photographs shows that most surface features have subsurface expressions and their relationship can be complex. (Knapp-USGS)

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CIRCULATION OF AN INCOMPRESSIBLE ICE

COVER, Washington Univ., Seattle. Div. of Marine

D. A. Rothrock.
AIDJEX Bulletin No 18, Washington University
Division of Marine Resources, p 61-68, February
1973. 5 fig, 8 ref.

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Descriptors: *Sea ice, *Ice cover, *Artic Ocean, Ocean circulation, Stress, Movement, Equations, Identifiers: *AIDJEX study.

The steady circulation of sea ice in the Arctic Ocean was calculated assuming that the ice is an incompressible material. The boundary conditions incompressible material. The boundary conditions require no flux across a coastal boundary and either no flux or no stress on the Barents Sea boundary. The continuity equation was solved with divergence given positive, negative, and zero values in different calculations. The momentum equation and continuity equations were solved for the velocity and the ice pressure field. The pattern of the calculated flow field and, in most regions, ice speeds are quite realistic. The calculated velocities between Greenland and Spitzbergen are about 15 cm per sec. Maximum calculated ice pressures of the order of 100 million dyne per cm are similar to values for maximum pressure in ridging 2-meter ice. The calculated regions of high pressure correspond to areas of intense ridging north of Greenland and Ellesmere Island. (Knapp-USGS) W73-07243

CRACK PROPAGATION IN SEA ICE: A FINITE

ELEMENT APPROACH, Washington Univ., Seattle. Div. of Marine

B. Mukherji.
AIDIEX Bulletin No 18, Washington University
Division of Marine Resources, p 69-75, February
1973. 3 fig, 10 ref.

Descriptors: *Sea ice, *Ice, *Strength of materials, *Finite element analysis, *Cracks, Failure (Mechanics).
Identifiers: *AIDJEX study.

Crack propagation in sea ice may be solved using the finite element procedure. A long thick ice sheet floating in water and subjected to a thermal gradient is idealized as a beam on an elastic foundation. The entire region is divided into small elements. A two-dimensional elasticity problem is solved to get a detailed description of the stresses and displacements as well as the total strain energy in the body. The crack depth is increased in increments and the calculation is thereby repeated to obtain a plot of the total strain energy ys. crack obtain a plot of the total strain energy vs. crack depth. From this plot, the stress intensity factor is calculated. (Knapp-USGS)

DETERMINING THE STRENGTH OF SEA ICE SHEETS,

Washington Univ., Seattle. Div. of Marine

M. M. Mohaghegh.
AIDJEX Bulletin No 18, Washington University
Division of Marine Resources, p 96-109, February 1973. 4 fig, 15 ref.

Descriptors: *Sea ice, *Strength of materials, *Failure (Mechanics), *Mechanical properties, *Salinity, Temperature, Bearing strength, Ice, Ice cover, Compressive strength, Deformation, Shear strength, Tensile strength, Yield strength. Identifiers: AIDJEX study.

The sea-air interaction of an ice-covered ocean involves continuous failure and refreezing of the ice cover. Analysis of this failure requires a knowledge of the strength of properties of the ice sheets. The strength of sea ice is essentially a func-

tion of the brine content and the applied stress rate. Brine content is determined by the salinity and temperature. The salinity profile of sea ice sheets is assumed to be a function of the thickness. The temperature profile is determined by the season, mean air temperature, and the depth of the snow cover. The tensile and compressive strengths snow cover. The tensile and compressive strengths of sea ice versus brine volume are based on axial test data. The salinity and temperature profiles are combined to determine the brine volume profile. The tension and compression strength profiles are calculated from the brine volume profiles and the curves relating strength to the brine volume. The axial strength profiles are integrated to determine the normal force capacity of sea ice. The flexural strength of ice sheets is determined from beam tests. (Knapp-USGS)

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Ice

inice PERCOLATION RATE AS AFFECTED BY THE INTERACTION OF FREEZING AND DRYING PROCESSES OF SOILS, Department of Agriculture, Swift Current (Saskatchewan). Research Station. For primary bibliographic entry see Field 02G. W73-07249

DEVELOPMENT OF A SEA-ICE PENETROME-

TER, Coast Guard, Groton, Conn. Research as Development Center.

J. A. McIntosh, C. W. Young, and J. P. Welsh.

Journal of Petroleum Technology, Vol 25, p 249256, March 1973. 18 fig, 3 tab, 8 ref, append.

Descriptors: *Sea ice, *Ice cover, *Instrumenta-tion, *Telemetry, Artic, Penetration, Aircraft. Identifiers: *Ice thickness, *Penetrometers (Ice).

For use in determining the thickness of sea ice a 50-lb, pencil-shaped projectile was developed. The device contains an accelerometer and a radio that transmits to a receiving station aboard a launching aircraft. In the tests the thickness of the ice (when it was completely penetrated) or the depth of penetration (when only partly penetrated) can be calculated to within about 3 in. (Knapp-USGS) W73-07250

ICE NUCLEATION BY COPRECIPITATED SILVER IODIDE AND SILVER BROMIDE, State Univ. of New York, Albany. Atmospheric Sciences Research Center.

B. Vonnegut, and H. Chessin. Science, Vol 174, No 4012, p 945-946, Nov 26, 1971. 3 fig, 5 ref.

Descriptors: *Freezing, *Supercooling, *Water cooling, *Ice, Analytical techniques, *Silver iodide, Bromides, Laboratory tests, Nucleation, Crystal growth, Water chemistry.

Identifiers: Silver bromide, Ice nucleating.

The ability of silver iodide to cause freezing of sune ability of sure roduce to cause freezing of supercooled water is improved if up to 30 percent of the iodine atoms in the crystal are replaced with bromine atoms. One of several explanations offered for the effectiveness of AgI in initiating the freezing of supercooled water involves its crystal structure, which is similar to that of ice. A theory structure, which is similar to that of ice. A theory of nucleation catalysis based on the elastic distortion that results because the lattice constant of AgI is 1.5 percent larger than that of ice accounts for the 2.5 deg C of supercooling that is required to cause water to freeze in the presence of AgI and leads to the prediction that a substance having a smaller lattice misfit would be an even better nucleus. By conrecipitating AeR with AeI cleus. By coprecipitating AgBr with AgI etastable solid solutions have been formed in which Br atoms are substituted for as many as 30 mole percent of the I atoms in the AgI crystal structure. (Woodard-USGS)

CALCULATION OF THE COMPETENCE OF AN ICE-COVERED STREAM (RASCHET TRANSPORTIEUVUSHCHEY SPOSOBNOSTI POTOKA, POKRYTOGO L'DOM), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J. W73-07260

AN ANALYSIS OF THE SMALL-SCALE STRENGTH TESTING OF ICE, Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office. K. R. Masse.

Grant Project Other.

K.R. Masser.

Available from the National Technical Information Service as COM-72-10294, \$3,00 in paper copy, \$0.95 in microfiche. Sea Grant Project Report MITSG 72-6, January 25, 1972. 138 p, 45 fig, 3 tab, 75 ref, 4 append.

Descriptors: "Ice cover, "Bearing strength, "Construction, "Model studies, "Analytical techniques, Strength, Stress analysis, Strain measurement, Mathematical studies, Equations, Ice, Properties, Cold regions, Engineering structures, Design criteria, Ice-water interfaces.

Identifiers: Floating ice sheets.

An analytical approach to predict the strength of floating ice sheets is described. Certain patterns in the test suggest that the plasticity of the individual crystal is a controlling factor. Ice crystal plasticity is dominated by basal glide, and the stress-straintime properties have the characteristics of strain softening. A stress-strain-time relation is proposed which best matches the reported results. This relation is used in analytical models which treat the which best matches the reported results. This relation is used in analytical models which treat the small-scale sample as an assembly of grains. A modeling by springs and dashpots shows how for aliure stress in uniaxial tension increases with increasing strain rate in a given range. A finite element model for a polycrystalline sample gives quantitative support for this result, and the resulting curve is very similar to that obtained by previous experiments. (Woodard-USGS) W73-07275

BEACH PROCESSES IN AN ARCTIC EN-VIRONMENT, McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02J.
W73-07323

STATES COAST GUARD, Department of the Environment, Ottawa (On-tario). Inland Waters Branch. For primary bibliographic entry see Field 05B. W73-07393 ARCTIC WINTER OIL SPILL TEST, UNITED

BENEFICIAL MODIFICATIONS OF THE MARINE ENVIRONMENT. For primary bibliographic entry see Field 02L. W73-07395

ICE ON THE OCEAN AND WORLD CLIMATE, RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 021.. W73-07396

DEFORMATION AND STRENGTH OF ICE, Arkticheskii i Antarkticheskii Nauchno-Iss-ledovatelskii Institut, Leningrad (USSR).

v. v. Lavrov. Available from NTIS, Springfield, Va 22151 as TT70-50130 Price 53.00 printed copy. Israel Pro-gram for Scientific Translations, Jerusalem, 1971. 164 p. (T170-50130; Translated from Russian, Gidrometeorologicheskoe Izdatel' stvo, Lenin-grad, 1969.)

Descriptors: *Ice, *Mechanical properties, *R-heology, *Strength of materials, Shear strength, Tensile strength, Compressive strength, Elasticity (mechanical), Friction, Shear, Poisson ratio, Youngs modulus, Loads (forces), Pressure, Strain, Stress, Tension, Water properties, Water types, Model studies.

Identifiers: *USSR, *Ice physics, *Ice mechanics, Ice structure, Ice properties, Ice crystals, Ice growth, Ice failure, Flexure (bending), Cantileverbeam tests.

The structure and mechanical properties of ice are examined in this revised and augmented edition of the book 'Problems of the Physics and Mechanics of Ice,' published in 1962. The laws of deformation and strength are applied to cases of loads acting on ice for short periods of time, and rheological models are formulated to analyze the visco-elastic behavior of ice. (Josefson-USGS)

SNOW AND SNOW AVALANCHES (SNEG I SNEZHNYYE LAVINY). Vysokogornyi Geofizicheskii Institut, Nalchik

Vysokogornyy Geofizicheskiy Institut Trudy, No 18, M. A. Dolov, editor, Leningrad, 1972. 152 p.

Descriptors: *Snow, *Snow cover, *Avalanches, Mudflows, Glaciers, Forests, Valleys, Slopes, Mountains, Meteorology, Frost, Precipitation (Atmospheric), Precipitation gages, Physical properties, Mechanical properties, Movement, Velocity, On-site investigations, osalytical techniques, Rousticest. Equations. Identifiers: *USSR, *Snow Avalanche hazards.

The physics of snow cover and dynamics of snow avalanches are investigated in this collection of 10 papers by workers of the High-Mountain Geophysics Institute at Nal'chik, North Caucasus. Results are presented of on-site investigations of avalanches, mudflows, and glaciers on northern slopes of the Greater Caucasus range, and new techniques are developed for determining precipitation in orographic areas. (Josefson-USGS) W73-07415

DETERMINATION OF SUB-NANOGRAM QUANTITIES OF SILVER IN SNOW BY FURNACE ATOMIC ABSORPTION SPECTROMETRY, Montana State Univ., Bozeman. For primary bibliographic entry see Field 05A. W73-07573

SNOWFALL PROPERTIES OF LAKE ERIE AND ONTARIO STORMS, State Univ. of New York, Albany.
J. E. Jiusto, and M. L. Kaplan.
In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publication, Vol 16, p 17-24, 1971. 4 fig, 4 tab, 6 ref. NOAA Grant No E22-13-69 G.

Descriptors: *Storms, *Great Lakes, *Snowfall, *Climatology, *Meteorology, Synoptic analysis, Precipitation (Atmospheric), Snow cover, Weather, Great Lakes region, Lake Erie, Lake Identifiers: *Snowstorms.

The Great Lakes snowstorm is one of the most pronounced examples of vigorous wintertime energy exchange to be found in the United States. These storms characteristically form as cold Arctic air passes over the relatively warm waters of the Great Lakes in late fall and early winter. The ensuing fluxes of heat, moisture, and momentum

Group 2C-Snow, Ice, and Frost

lead to intense horizontal and vertical gradients which, in turm, alter the horizontal winds, low-level convergence fields, and vertical motions. When these mesoscale lake effects couple with a When these mesoscale lake effects couple with a synoptic scale trough, the most intense energy transfer and organization can take place. Snowfall is highly dependent on time of year and wind direction, late autumn occurrence and SW-W wind flows being associated with the most intense storms. A statistical analysis showed a tendency for snowfall depth to drop off rapidly with inland distance, for snowfall-meltwater ratios to be inversely related to inland distance, and for orgraphic effects to be less important than lake effects in the total snowstorm phenomena. Heavier crystal forms, including rimed crystals and graupel are concentrated near the coast and for lighter snownonan, mentaing rimed crystals and graupel are concentrated near the coast and for lighter snow-flakes to be most prevalent inland. Intense snow-falls are better organized and more compact with a strong dependence of total water on time of year or lake temperature. (Knapp-USGS) W73-07659

EFFECTS OF WATERSHED ENVIRONMENT

ON SNOWMELT,
Agricultural Research Service, Danville, Vt. New
England Watershed Research Center. R. L. Hendrick

In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publica-tion, Vol 16, p 25-32, 1971. 8 fig., 1 ref.

Descriptors: *Snowmelt, *Water yield, *Floods, Streamflow, Topography, Temperature, Slopes, Altitude, Albedo, Solar radiation, Melting, Snow cover, Model studies, Mathematical models.

The rarity of serious spring snowmelt flooding in northern New England is due to a natural snow-melt flood control mechanism inherent in the environmental characteristics of the region. Snow melts faster and earlier in the sun than in the shade. Snow melts faster and earlier on the south side of a hill than it does on the north side. Snow melts earlier in the valleys than on the mountains.

An environment-snowmelt model was adapted to
the upper New England area and used to show: (1) differences in melt rates within a watershed; (2) differences in average melt between watersheds of sharply contrasting environments; and (3) dif-ferences between watershed melt for selected types of melting weather. Northern watersheds of hilly complex terrain and mixed forest cover have a built-in snowmelt flood control mechanism; the more spatially varied the forests, slopes and eleva-tions are the more effective the flood control mechanism. Tropical air with high dewpoints and strong winds is the most efficient snowmelting waters and is the most efficient snowmelting weather and is the only way the atmosphere can overwhelm a diverse watershed's natural defenses against rapid snowmelt. (Knapp-USGS) W73-07660

PROBABILITY FORECASTS OF WATER SUR-FACE TEMPERATURES OF THE ST. LAWRENCE RIVER BETWEEN KINGSTON, ONTARIO AND SOREL, QUEBEC, Department of Fisheries and Forestry, Cornwall

(Ontario). Water Planning and Operations Branch. For primary bibliographic entry see Field 04A. W73-07661

THE DETERMINATION OF ICE FORCES ON

SMALL STRUCTURES, Acres (H. G.) and Co. Ltd., Niagara Falls (On-

tario). Hydraulic Dept.
C. H. Atkinson, D. L. R. Cronin, and J. V. Danys.
In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publication, Vol 16, p 49-61, 1971. 6 fig, 6 ref. Descriptors: *Ice loads, *Instrumentation, *Data collections, *Telemetry, Rivers, Ice jams, Pressure, Navigation, St. Lawrence River, Strain gages, Strain measurement.

The total force exerted by ice on a small structure designed to house navigation aids marking the centerline of a shipping channel may be measured using self-contained load-sensing panels set into the face of the structure. These panels are connected electrically to an integrating circuit which automatically determines the resultant moment of the forces on the structure. The resultant moment data are collected by means of five digital clocks which, using a maximum expected moment as a datum, recorded the total elapsed time the moments are invarious percentage ranges of the reference value. Remote collection of digital data is possible. (Knapp-USGS)

PROBABILITIES OF EXTREME SNOWFALLS

PROBABILITIES OF EXTREME SNOWFALLS AND SNOW DEPTHS, National Weather Service, New Brunswick, N.J. D. V. Dunlap. In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publica-tion, Vol 16, p 64-67, 1971. 1 tab, 14 ref.

Descriptors: *Snowfall, *Statistics, *Frequency analysis, Distribution patterns, Probability, Forecasting, Precipitation (Atmospheric), Snow, New Jersey. Identifiers: *Snow loads.

Extreme snowfalls at approximately 120 stations in 12 northeastern states and in the Province of New Brunswick are analyzed. In addition to snow-fall, a similar coverage of extreme snow depth was calculated for most of those stations. A standard of the stations of the s carcuated for most of those stations. A standard period of 15 seasons, from the winter of 1949-50 through that of 1963-64, was selected in order to provide compatibility for the analyses. The Lieblein method was chosen for these studies as it permits the utilization of all available data, instead of rendering some useless, as other methods of rendering some useless, as other methods might. Analyses for the complete periods of record were made for all stations. For purposes of com-parison, compatible short periods of 12 seasons parison, compatible short periods of 12 seasons (1949/50-1960/61) were evaluated for 14 stations (Knapp-USGS) W73-07663

FROZEN PRECIPITATION-ITS FREQUENCY AND ASSOCIATED TEMPERATURES, Cold Regions Research and Engineering Lab., Cold Regions Research and Engir Hanover, N. H. M. A. Bilello.

In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publica-tion, Vol 16, p 68-80, 1971. 8 fig, 5 tab, 15 ref.

Descriptors: *Precipitation (Atmospheric), *Statistics, *Freezing, *Snowfall, *Ice, Meteorology, Ice loads, Sleet, Data collections, Meteorological data, Weather, Storms, Snow. Identifiers: *Freezing rain, *Frozen precipitation.

Graphs showing the probability of frozen precipitation at 11 locations in the U.S. and Canada are presented as possible aids in devising methods for improving municipal operations. Average temperatures observed at the time of precipitation are also given and related to long-term mean-air temperatures. The longest continuous period of freezing a firzing and fire-graph divizion. term mean-air temperatures. The longest continuous period of freezing rain and freezing drizzle observed during the period of record is given for each city. The tabulated data consist of a count of the hours during each month when frozen precipitation occurred at specific temperatures. The average air temperatures observed during the precipitation period are given. (Knapp-USGS) W73-07664 THE PARAMETERIZATION AND PREDICTION OF SYNOPTIC-SCALE INFLUENCES ON GREAT LAKES SNOWSTORMS, State Univ. of New York, Albany. Dept. of Atanospheric Sciences.
For primary bibliographic entry see Field 02B.
W73-07665

SNOWMELT IN HARDWOOD FORESTS,

SNOWMELT IN HARDWOOD FORESTS, Forest Service (USDA), Durham, N.H. Northeast-ern Forest Experiment Station. C. A. Federer, and R. E. Leonard. In: Proceedings of the 28th Annual Snow Con-ference, February 4-5, 1971, Fredericton, N.B., Canada: Eastern Snow Conference Publication, Vol 16, p 95-109, 1971. 5 fig, 3 tab, 14 ref.

Descriptors: *Snowmelt, *Forests, *Deciduous forests, Winds, Solar radiation, Model studies, Albedo, Rusoff, Snow cover, Energy budget, Vegetation effects, Convection.

Snowmelt differences among forest covers result from differences in energy transfers by solar and longwave radiation, convection, and condensation-evaporation. Adsorption of solar radiation is variable, but it can be estimated by using a canopy model. During the day, downward longwave radiation is about 0.04 cal per sq cm per min higher under hardwood forest than in the open. Air temperature and humidity have practically the same values under a hardwood canopy as they do in an adjacent cleared area, while wind speed is reduced under hardwoods to about half that in the open. Any differences in convection-condensation melt under hardwoods to about half that in the open.
Any differences in convection-condensation melt
between hardwoods and the open arise from the
difference in wind speed and from differences in
turbulent transfer. Transport of melt water
through the soil to a stream can be modelled by an electrical analog. Snowmelt rate thus may be esti-mated from measured streamflow. (Knapp-USGS) W73-07666

2D. Evaporation and Transpiration

TRANSPIRATION IN THE PISTACHIO UNDER SEMI-SAVANNAH CONDI-TIONS IN THE PISTACHIO-WOOD-LANDS OF

TADZHIKISTAN, (IN RUSSIAN), Akademiya Nauk Tadzhikskoi SSR, Dushanbe. K. P. Popov

R. P. Foldov. Ekologiya. Vol 2, No 5, p 44-52, 1971. Illus. Identifiers: Pistachio-D, Pistacia-Vera-D, Savan-nah, *Tadzhikistan, *Transpiration, USSR, Woodland

Pistacia vera has a high intensity of transpiration which increases towards summer and decreases in the autumn. During the vegetative period in south Tadzkikistan the trees use up to 90-100 mm of precipitation. In typical sierozem there is suffirecient moisture, even in dry years. Moisture for the highly intense transpiration during the second half of the vegetative period is supplied from deep soil ground layers, and is maintained by intra-soil vaporization and condensation. By ecological, vaporization and condensation. By ecological, morphologico-anatomical and physiological characteristics this tree is a xeromesophyte.--Copyright 1972, Biological Abstracts, Inc. W73-07303

ENERGY EXCHANGE STUDIES AT THE EARTH'S SURFACE - I. ENERGY BUDGETS OF DESERT, MEADOW, FOREST AND MARSH

SITES, Oregon State Univ., Corvallis. Dept. of Forest En-

L. W. Gay. L. W. Gay. Available from the National Technical Informa-tion Service as PB-218 825, \$3.00 in paper copy, \$0.95 in microfiche. Oregon Water Resources Research Institute, Corvallis, Technical Report No. 73-I, January 1973, 89 p, 31 fig, 15 tab, 55 ref. Descriptors: "Evapotranspiration, budget, "Microclimate, Energy transfer, Oregon, "Land classification, Convection, Climate, Water loss, Evaporation, Instrumentation, Data aquisition, Sampling, Forests, Marshes, Grasslands. Identifiers: Energy exchange, Latest energy transfer, Mean energy budget, Pumice.

transfer, Mean energy budget, Pumice.

The energy exchange characteristics of four common landscape types in the high semi-arid plateau in central Oregon, east of the Cascade Range, were evaluated during the summers of 1969 and 1971. The surfaces studied were pumice, meadow, forest, and marsh. A portable environmental data acquisition system was developed for sampling micrometeorological variables with a high degree of precision. The construction and operation of the system is described. The system was deployed for various periods during mid-to late summer at the four experimental sites. Clear weather periods were selected for analysis in order to examine the energy exchange processes at a time of maximum activity. The mean energy budget components for two such clear days were calculated. The maximum latent energy transfer occurred over the marsh and meadow; these surfaces were plentifully supplied with water. Latent energy transfer was enhanced at both sites by the advection of energy from the warmer surroundings. The large heat canactivity of the marsh planed as investity of the marsh planed as investigation. was enhanced at both sites by the advection of energy from the warmer surroundings. The large heat capacity of the marsh played an important role in maintaining evaporation throughout the night hours. The studies revealed that the forest was a very effective energy exchanger. Though only moderate latent energy transfer occurred there, convection was the largest, resulting in the maximum total transfer of all the surfaces studied. The results provide a basis for extingating max-The results provide a basis for extimating maximum rates of evapotranspiration from the surfaces that are commonly found in central Oregon. (See also W73-07424)

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ENERGY EXCHANGE STUDIES AT THE EARTH'S SURFACE - II. ENERGY BUDGET OF

A PUMICE DESERT,
Oregon State Univ., Corvallis. Dept. of Forest En-

Available from the National Technical Informa-tion Service as PB-218 791, \$3.00 in paper copy, \$9.95 in microfiche. Oregon Water Resources Research Institute, Corvallis, Technical Report No. 73-2, January 1973, 142 p. 17 fig, 11 tab, 75 ref, 4 append. OWRR A-001-ORE (18), Vol. II.

Descriptors: *Evapotranspiration, *Energy transfer, *Oregon, *Radiation, *Heat transfer, Energy budget, Microclimate, Evaporation, Cli-mate, Water loss, Vapor pressure, Semiarid cli-

Identifiers: *Pumice desert, *Heat flux, Heat flux stability correction, Energy exchange, Bowen ratio model, Soil heat flux, Sensible heat flux, Latent heat flux, Plateau region.

The energy budget of a pumice desert surface was analyzed under clear skies during early, mid- and late summer periods. The pumic site is in the semi-arid plateau region of Central Oregon at an elevation of about 1500 meters. The flat pumice surface is approximately 250 hectares in extent, and is boredred by a sparse lodgepole pin forest. Energy budget components of net radiation, soil heat flux, sensible heat flux, and latent heat flux were evluated for one clear day in each of the three measurement periods. The most significant features of the pumice desert energy budget were: (1) Radiant energy transformed by the pumice surface (net energy transformed by the pumice surface (net radiation) was approximately 70 percent of the amount measured over a nearby forested surface; (2) Energy transfer into the soil amounted to less (2) Energy transfer into the solutionization less than 3 percent of the energy supplied to the surface by net radiation, while surface temperatures varied through a 50 C range each day; (3) Sensible heat flux dissipated 85 percent of the net radiation

supplied to the surface; and, (4) Evaporation at the pumice site averaged less than 0.05 cm per day, although the pumice beneath the dry surface layer remained moist. A unique stability correction for the aerodynamic flux analysis of sensible or latent heat was developed to extend over the wide stability range found at the pumice site. A method for estimating the uncertainty of the measurement system and of the resultant flux analyses was developed and applied to the results of this study. The average relative uncertainties of the net radiation and soil heat flux analyses were estimated to be less than 1 percent and 5 percent, respectively. The average uncertainty of the sensible heat flux analyses was estimated to be 3 percent when using the Bowen ratio model. The corresponding figures for latent heat flux are 25 percent with the aerodynamic model and 30 percent with the Bowen ratio model. The larger percentage uncertainties associated with latent heat are due in part to the small vapor pressure gradients near the pumice surface, relative to the measurement capabilities, and in part to the small values of the latent heat flux. (See also W73-07423)

ENVIRONMENTAL CONTROL OF STOMATAL ACTIVITY IN MATURE SEMIARID SITE PON-

DEROSA PINE, Oregon State Univ., Corvallis. For primary bibliographic entry see Field 02I. W73-07641

A COMPENSATING METHOD FOR MEASUR-ING CARBON DIOXIDE EXCHANGE, TRANS-PIRATION, AND DIFFUSIVE RESISTANCES OF PLANTS UNDER CONTROLLED ENVIRON-

MENTAL CONDITIONS, Illinois Univ., Urbana. Dept. of Botany. F. A. Bazzaz, and J. S. Boyer. Ecology, Vol 53, No 2, p 343-349, Early Spring 1972. 5 fig. 22 ref. OWRR-A-028-ILL (5) and B-036-ILL (9).

Descriptors: *Photosynthesis, *Respiration, *Transpiration, *Environmental effects, *Environmental control, Plant growth, Metabolism, Boundary processes, Light, Diffusivity, Laboratory tests, Air circulation, Microenvironment, Capillary action, Analytical techniques. Identifiers: Carbon dioxide exchange, Infrared gas

Rates of photosynthesis, respiration, and transpiration provide important information about the response of plants to the environment. Infrared gas analysis, which permits rapid and simple measurement of CO2 exchange, has been increasingly used for determination of rates of photosynthesis and respiration. However, one of the problems encountered in experiments in advante control of and respiration. However, need the proteins en-countered in experiments is adequate control of environmental conditions. A semi-closed compen-sating system is described for measuring CO2 exchange and transpiration simultaneously where environmental conditions are controlled. The comenvironmental conditions are controlled. The com-pensating feature permits conditions in the as-similation chamber to be kept uniform and within narrow limits. Temperature, relative humidity, carbon dioxide concentration, wind speed, and light intensity may be varied within the system. Since transpiration and photosynthesis can be measured simultaneously, diffusive resistances to carbon dioxide and water transport may also be calculated from the data. The performance of the caroon dioxide and water transport may also be calculated from the data. The performance of the apparatus was checked with Ambrosia trifida L. Net photosynthesis occurred at a rate of 32 mg/hr/sq. 4m of leaf area at 30 C under saturating light intensities, and transpiration took place at 5.3 light intensities, and transpiration took place at 5.3 gm/hr/sq dm under the same conditions. Both processes were sensitive to CO2 concentrations from 100 to 400 ppm and to temperatures between 15 and 30C. Respiration was relatively insensitive to temperature below 30C. Diffusive resistances to CO2 transport were 0.08, 0.8, and 5.2 sec/cm for the boundary layer of the leaf, internal gas phase of the leaf, and the mesophyll cells, respectively. Diffuse resistances to water transport were 0.05 and 0.5 sec/cm for the boundary layer and internal gas phase of the leaf, respectively. (Black-N72004) W73-07655

2E. Streamflow and Runoff

OBSERVATIONS OF ICE MOTION AND IN-TERIOR FLOW FIELD DURING 1971 AIDJEX PILOT STUDY, Washington Univ., Seattle. Dept. of Oceanog-For primary bibliographic entry see Field 02C. W73-07240

CIRCULATION OF AN INCOMPRESSIBLE ICE COVER, Washington Univ., Seattle. Div. of Marine ary bibliographic entry see Field 02C. For primar W73-07243

FLOOD SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971, Geological Survey, Anchorage, Alaska. J. M. Childers. Geological Survey Basic-Data Report, October 1, 1972. 16 p, 1 fig, 1 tab, 22 ref.

Descriptors: *Flood profiles, *Flood data, *Flood frequency, *Pipelines, *Alaska, Engineering structures, Project planning, Flood forecasting, Flood protection, Maximum probable flood, Construction, Conveyance structures, Oil, Environ-mental effects, Oil pollution, Oil spills, Data col-Identifiers: *Trans-Alaska Pipeline.

Information on floods along the Trans-Alaska Pipeline System (TAPS) is needed to assess possible environmental damages and to aid in the design and management of the pipeline and associated facilities. Existing flood information and flood surveys are described at 13 sites along the northern segment of the proposed TAPS route from Prudhoe Bay to the Salcha River. The tabulated survey results include the numbered sites for location on a man and are arranged in numerical order from 1. results include the numbered sites for location on a map and are arranged in numerical order from 1, Sagavanirktok River near Sagwon, to 13, Salcha River near Salchaket, preceding in a southerly direction along TAPS route. The data allow direct comparison of flood data with design flood magnitudes for these sites and also may have some transfer value for estimating design flood magnitudes at other sites on the same streams or on other nearby or similar streams having similar streams contact the sites of the sites of the sites on the same streams or on other nearby or similar streams having similar streams contact the sites. The use of the sites of basin and channel characteristics. The use of hydraulicmethods to estimate bankfull and maximum evident flood discharges provides signifi-cant data for planning and design of structures in floodways where man has had little experience. (Woodard-USGS)

FLOW DYNAMICS, REGIME, THEORY, AND METHODS OF COMPUTATION AND MEASUREMENT OF SEDIMENTS AND WASTE WATER (DINAMIKA POTOKOV, REZHIM, TEORIYA, METODY RASCHETA I IZMERENIYA NANOSOV I STOCHNYKH VOD). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (UISSR) grad (USSR). For primary bibliographic entry see Field 02J. W73-07257

WIND-WAVE DEVELOPMENT AND SEDI-MENT SATURATION OF WATER MASSES (RAZVITIYE VETROVOGO VOLENIYA I

Group 2E-Streamflow and Runoff

NASYSHCHENIYE VODNYKH MASS NANOSAMI), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02J. W73-07258

PROBLEMS IN THE THEORY OF LAMINAR AND SEDIMENT- AND WASTEWATER-CARR-YING TURBULENT CHANNEL FLOWS (VOPROSY TEORII DVIZHENIYA RUS-LOVYKH POTOKOV --TURBULENTNYKH, PEREMESHCHAYUSHCHIKH NANOSY I PRIMESI, I LAMINARNYKH), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). For prim

bibliographic entry see Field 02J. W73-07259

EFFECT OF COARSE-SEDIMENT GRAIN SHAPE AND ORIENTOATION ON FLOW RE-SISTANCE (VLIYANIYE FORMY KRUPNYKH CHASTITS NANOSOV I IKH ORIYENTATSII V POTOKE NA GIDRODINAMICHESKOYE SOPROTIVLENIYE), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR).

ary bibliographic entry see Field 02J. W73-07261

APPLICATION OF FLOW-COMPETENCE FOR-MULAS TO CALCULATION OF ANNUAL SUSPENDED-SEDIMENT DISCHARGE (PRIMENENIYE FORMULY TRANSPORTIRUYUSHICHEY SPOSOBNOSTI POTOKA DLYA RASCHETA GODOVOGO STOKA VZ-VESHENNYKH NANOSOV), GOSUdarstvennyi Gidrologicheskii Institut, Leningraf (11888)

grad (USSR). For primary bibliographic entry see Field 02J.

W73-07263

CLASSIFICATION OF RELATIONSHIPS CLASSIFICATION OF RELATIONSHIPS
BETWEEN SUSPENDED-SEDIMENT
DISCHARGES AND WATER DISCHARGES
(TIPIZATSIYA ZAVISIMOSTEY RASKHODOV
VZVESHENNYKH NANOSOV OT RASK-

HODOV VODY), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02J.

W73-07264

PRELIMINARY REPORT ON THE WATER RESOURCES OF CENTRAL MAUI, HAWAII, Geological Survey, Honolulu, Hawaii. For primary bibliographic entry see Field 04B. W73-07276

SPECIAL FLOOD HAZARD INFORMATION REPORT, MUD CREEK, BROKEN BOW, NEBRASKA.

Army Engineer District, Omaha, Nebr. For primary bibliographic entry see Field 04A.

FLOODS IN MARENGO SOUTH QUADRAN-GLE, NORTHEASTERN ILLINOIS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-07384

FLOODS IN HAMPSHIRE QUADRANGLE, NORTHEASTERN ILLINOIS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

SPECIAL FLOOD HAZARD INFORMATION REPORT, BEAVER CREEK, ST. EDWARD, NEBRASKA. Army Engineer District, Omaha, Neb.

Report, December 1972. 21 p, 15 fig, 5 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood protection, *Flood recurrence interval, *Nebraska, Streamflow, Flow characteristics, Flood data, Peak discharge, Flood plains, Channel improvement, Engineering, Planning, Evaluation, Hydrologic data ment, Engineering, Planning, Evaluation, Hydrologic data. Identifiers: *St. Edward (Nebr), Beaver Creek (Neb), Standard project flood, Intermediate re-

St. Edward, Nebraska, has sustained frequent flood damages from Beaver Creek and the small tributary North Coulee. The Omaha District, Corps of Engineers, is currently making a feasibility study for a potential flood control project at St. Edward. Basin and stream characteristics, flood history, and the probable hazard of major flooding under activities conflictions of Beauer Creek et al. under existing conditions of Beaver Creek at St. under existing conditions of Beaver Creek at St. Edward are described. References also are made to North Coulee which produces flooding in St. Edward. Two potential floods on Beaver Creek, the Intermediate Regional and Standard Project Floods, are analyzed and their extent of flooding is home. On a page 200 man. Water surface profiles Floods, are analyzed and their extent of flooding is shown on an area map. Water surface profiles show the probable depths of floods relative to the channel bed. These flood elevations can also be projected across the flood plain. Several cross sec-tions are presented to indicate bank elevations and the depths of potential floods across the valley. The data and drawings represent reasonable delineations of the flood hazard at St. Edward. A ueuneauons or the Hood hazard at St. Edward. A stage recorder gage is located on Beaver Creek at Genoa, 12 miles downstream from St. Edward. Records from October 1940 show a maximum discharge of 21,200 cfs on July 19, 1950. (Woodard-USGS)

STATISTICAL GEOMETRIC SIMILARITY IN

DRAINAGE NETWORKS,
Thomas J. Watson Research Center, Yorktown
Heights, N. Y.
For primary bibliographic entry see Field 04A. W73-07402

WAVES OFF MANGALORE HARBOR-WEST

WAVES OFF MANUALDAS INAUCONSTORM COORT OF INDIA,
Karnataka Regional Engineering Coll., Suratkal
(India). Dept. of Applied Mechanics and Hydrology. J. Dattatri.

Journal of Waterways, Harbors and Coastal En-gineering Division, American Society of Civil En-gineers. Vol 99, No WWI, Paper 9532, p 39-58, February 1973. 14 fig, 24 ref, 1 append.

Descriptors: *Ocean waves, *Statistics, Frequency analysis, Waves (water), Time series analysis, Frequency, Wavelengths.
Identifiers: *India (Mangalore harbor).

Waves off Mangalore on the West Coast of India were analyzed statistically. Rayleigh distribution describes adequately the distribution of wave heights and this distribution is not especially sensitive to the spectral width. Wave heights are in good agreement with the Longuet - Higgins theoretical results, over a wide range of ocean wave environment. The highest waves reaching the coast are not associated with the longest periods. Severe waves occur only during the periods. Severe waves occur only during the mon-scoon season and the sea is practically calm during the fair-weather season. Based on a study of weather data and cyclone tracks for the Arabian Sea, it is recommended that the design wave could be based on the annual wave evaluated from recorded data. Wave characteristics evaluated using Tucker's Method of Analysis compare favorably with computed data. (Knapp-USGS) W73-07403

TURBULENCE IN SHALLOW WATER FLOW UNDER RAINFALL, Purdue Univ., Lafayette, Ind. School of Civil En-

gineering.
I. T. Kisisel, R. A. Rao, and J. W. Delleur. Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 99, No EMI, Paper 9535, February 1973. 14 fig, 27 ref, 1

Descriptors: *Turbulence, *Overland flow, *Impact (Rainfall), *Rainfall-runoff relationships, *Roughness (Hydraulic), Turbulent flow, Precipitation (Atmospheric), Sheet flow, Surface runoff, Instrumentation, Rainfall simulators, Hydraulic models.

The effects of rainfall intensity, channel roughness, and bed slope on the mean velocity and the turbulence characteristics of shallow water flow were investigated. The mean and fluctuating velocities were measured by using constant-tenperature hot-film amemometers which were equipped with specially designed cylindrical sensors. The friction factor values increased in the presence of rainfall for flows over both the smooth well over however. and rough boundaries. The mean velocity distribu-tions were logarithmic. For flows with rainfall, the energy content increased in the high frequency range and the spectra were modified compared to flows without rainfall. Macroscales of turbulence for flows with rainfall increase whereas the microscales decrease slightly toward the free surface in comparison with the macro and microscales for flows without rainfall. (Knapp-

FIELD INVESTIGATIONS OF THE CHANNEL PROCESS (NATURNYYE ISSLEDOVANIYA RUSLOVOGO PROTSESSA), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR).
For primary bibliographic entry see Field 02J. W73-07407

LIMNOLOGICAL INVESTIGATIONS OF THE DANUBE RIVER (LIMNOLOGICHESKIYE ISS-LEDOVANIYA DUNAYA).
Akademiya Nauk USSR, Kiev. Instytut
Hidrobiologii.

Izdatel'stvo 'Naukova Dumka', Kiev, A. V. Topachevskiy, editor, 1969. 472 p.

Descriptors: Limnology, *Lakes, *Rivers, Tributaries, Deltas, Estuaries, Reservoirs, Biology, Microbiology, Hydrobiology, Aquatic anaimals, Aquatic plants, Aquatic plants, Aquatic plants, Aquatic plants, Aquatic microorganisms, Benthos, Water chemistry, Water properties, Water pollution, Fish management, Ecology, Conferences.

Identifiers: *USSR, *Danube River, Black Sea, Algology, Parasticloges, Algology, Parasitology.

This collection contains 52 papers presented at the Eleventh International Conference on Limnology of the Danube, held in Kiev, Russia, September 4-14, 1967. Participants in the conference included 14, 1967. Participants in the conference included delegates from Austria, Bulgaria, Hungary, USSR, Rumania, Yugoslavia, German Federal Republic, Czechoslovakia, and Switzerland. The reports presented at plenary sessions were grouped under seven subject headings: general problems of limnology (7 papers); sanitary hydrobiology, hydrochemistry, and microbiology (14 papers); algology, phytoplankton, and phytobenthos (7 papers); papers); zooplankton and zoobenthos (11 papers); parasitology (2 papers); fish management and reed-grass economy (8 papers); and effects of the Danube on northwestern regions of the Black Sea (3 papers).

Streamflow and Runoff-Group 2E

The papers are published either in Russian or German and are accompanied by a brief summary in the alternate language. (Josefson-USGS)

SPECTRA OF THERMALLY STRATIFIED TURBULENT FLOW WITH NO SHEAR, Sofia Univ., (Bulgaria). Dept. of Meteorology. S. Panchev, and D. Syrakov. Tellus, Vol 23, No 6, p 500-505, 1971. 1 fig, 15 ref.

Descriptors: *Mathematical studies, *Flow, *Tur-bulence, *Thermal stratification, Fluid mechanics, Buoyancy, Density, Velocity, Viscosity, Fluctua-tions, Density stratification, Kinetics. Identifiers: Bolgiano's theory, Lumley-Shur's

The idea of natural realization of the degree of in-teraction between the mean and turbulent fields is used in discussing equations describing the spec-tral balances of turbulent kinetic and temperature energy in a particular flow. The system of spectral equations is solved numerically and the result is presented in a figure. Previous quantitative con-clusions according to the assumation admits clusions according to the asymptotic solution are confirmed. In the case of stable stratification a general inertial range exists, in the middle of which general merual range exists, in the mudule of which a buoyancy sub-range appears with specific slopes of spectral curves. The contradiction between the theories of Bolgiano and Lumley-shur is resolved when it is shown tht both spectra are actually sub-ranges in one spectral curve. (Jerome - Vanderbilt) W73-07499

ROLE OF FLOOD PLAIN IN FLOOD DISCHARGE OF A RIVER CHANNEL, Gidrometeorologicheskii Institut, Leningrad (USSR).

For primary bibliographic entry see Field 02J. W73-07521

INTERACTION OF CHANNEL AND FLOOD-PLAIN STREAMS, Moskovskii Institut Inzhenerov Zheleznodorozh-

nogo Transporta (ÚSSR). G. V. Zheleznyakov.

G. V. Zheleznyakov.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 145-148, 1972 (release date). 1 fig, 8 ref.

Descriptors: *Flood plains, *Floods, *Discharge (Water), *Hydraulic models, *Overflow, Hydraulics, Streamflow, Stage-discharge relations, Floodways, Deposition (Sediments), Flood flow, Model studies, Flow characteristics, Flow rates.

Movement of water during flood periods occurs Movement of water during 1000d periods occurs with complicated interaction of the main (channel) and 100d-plain streams. The principal reason for this is the difference in hydraulic resistances of the channel and 100d plain. This causes large velocity gradients, formation of eddies, transverse exchange, and increased turbulence. This results in the increase of the stream's energy losses, reduction of stream velocity in the main channel. reduction of stream velocity in the main channel, and reduction of its discharge capacity. Generalization of the results of the experiments permits creation of the results of the experiments of the permits creation of the system of characteristics describing the process of interaction of streams. Methods of experimentation were developed at the Leningrad Institute of Hydrometeorology where a vertical wall at the channel edge was found to have less resistance to water movement than the interaction of streams. (Knapp-USGS)

THE DAM-BREAK PROBLEM, Tennessee Univ., Knoxville. For primary bibliographic entry see Field 08B. FURTHER DEVELOPMENT OF THE IMPLICIT DIFFERENCE SCHEME FOR FLOOD WAVE CALCULATION,

CALCULATION,
Technische Hogeschool, Delft (Netherlands).
M. B. Abbott, G. S. Rodenhuis, and A. Verwey.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research,
Paris, August 29-September 3, 1971, Volume 5, p
183-186, 1972 (release date). 5 fig.

Descriptors: *Flood waves, *Flood forecasting, *Mathematical models, Systems analysis, Floods. Identifiers: *Danube River.

Rivers and flood plains may be modeled using im-plicit difference schemes and alternating direction algorithms. The relations between flooding of suralgorithms. The relations between flooding of surrounding land the effective resistance offered to flow may be solved. Results are presented for stage and discharge computations during a flood wave at selected, nonequidistant points along the Danube, using both prototype and physical model data for reference. This type of model now appears as a viable instrument for process control and systems analysis. (Knapp-USGS) W73-07524

COMPUTATION OF EXTREME FLOODS IN A

COMPUTATION OF EXTREME PLOODS IN A LARGE RESERVOIR, Tennessee Valley Authority, Knoxville. Flood Control Branch.
J. M. Garrison, J. P. Granju, and J. T. Price.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris August 29. September 3, 1971, Volume 5, p. Paris, August 29-September 3, 1971, Volume 5, p 193-198, 1972 (release date). 3 fig, 3 ref.

Descriptors: *Floods, *Reservoirs, *Dam failure, *Stage-discharge relations, *Mathematical models, Tennessee Valley Authority, Peak discharge, Water levels, Water level fluctuations, Computer programs.

Both maximum possible and maximum probable floods were investigated in Guntersville Reservoir, one of nine mainstream TVA lakes. The average flow through the reservoir is about 42,000 cfs. The maximum known flood in this reach of the Tennessee River occurred in 1867, long before the TVA dams were built, and had a peak flow of about 455,000 cfs. In studying potential sites for a possible nuclear generating plant on this reservoir, design considerations and licensing regulations require that water surface elevations be determined for extreme floods. The calculations were made using an unsteady flow mathematical model and were repeated with a hypothetical sudden failure of the upstream Nickajack Dam at the time of the flood crest. Because of the broad flat peaks of the hydrographs, lag is not of great practical sigof the Hood crest. Because of the broad flat peaks of the hydrographs, lag is not of great practical significance. The assumed failure of the upstream dam increased the flood levels by only a couple of feet in the most upstream reaches, and had practically no effect on the middle and lower reaches. (Knapp-USGS) W73-07526

A MODEL FOR FLOOD COMPUTATIONS IN THE PARANA AREA, For primary bibliographic entry see Field 04A. W73-07527.

NUMERICAL ANALYSIS OF FLOW IN LAVER CULTURE FARM, National Research Institute of Agricultural En-

gineering, Hiratsuka (Japan). Div. of Fisheries Enneering

gineering.

J. Kato, and S. Hagino.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 205-212, 1972 (release date). 6 fig, 3 ref.

Descriptors: "Numerical analysis, "Bays, "Dredging, "Aquatic plants, Currents (Water), Roughness (Hydraulic), Mathematical models, Hydraulics, Tides, Water circulation. Identifiers: "Nori (Laver), Farming (Japan).

In Japan, 'Nori' laver, a seaweed, is cultured in bays. The flow of sea water is indispensible for its growth. The flow speed is generally apt to be delayed in culture farms, and therefore dredging or route making is carried out. Numerical analysis was used to calculate the state of flow of route making in Matsukawaurs Bay, located in the northeastern part of Japan. The daily total discharge from and into the mouth of the bay will be about 1.26 time that in the present condition. The flow velocity will decrease to about 59-80%. (Kaapp-USGS)

DROUGHT IMPACT ON REGIONAL ECONO-

MY, Colorado State Univ., Fort Collins, Dept. of Civil

Engineering.
For primary bibliographic entry see Field 06B.
W73-07640

AXISYMMETRIC SHALLOW SUBMERGED

TURBULENT JETS, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B. W73-07669

TELECONNECTIONS IN THE EQUATORIAL

PACIFIC OCEAN, Hawaii Univ., Honolulu, Dept. of Oceanography. Science, Vol 180, No 4081, p 66-68, April 6, 1973. 2 fig, 12 ref.

Descriptors: *Ocean currents, *Islands, *Monitoring, *Sea level, *Pacific Ocean, Thermal stratification, Climatic zones, Heat transfer. Identifiers: Geostrophic water transport, Eastern tropical Pacific, Climatic changes.

Geostrophic water transport by the equatorial countercurrent is compared with the observed sea level difference between two pairs of islands situated north and south of the current. The high cor-relation between the transport and the sea level difference makes it possible to construct a time se-ries for the countercurrent transport over a 21year period. The countercurrent carries warm water into the eastern tropical Pacific, and fluctuawater into the eastern tropical Pacific, and fluctua-tions in its strength give rise to temperature anomalies off Central America. Periods of excep-tionally high transport by the countercurrent in the western Pacific coincide with the occurrence of El Nino several thousand kilometers downstream and demonstrate the existence of teleconnections between events in the Pacific Ocean, (Land-IISGS) W73-07672

OUTSTANDING HYDROLOGIC EVENTS IN SOUTHWESTERN (VYDAYUSHCHIYESYA

GIDROLOGICHESKIYE YAVLENIYA NA YU-GO-ZAPADE SSSR). G. I. Shvets.

Gidrometeoizdat, Leningrad, 1972. 244 p, 308 ref.

Descriptors: "Hydrology, "Hydrologic data, "Meteorological data, "Climatic data, "Documentation, Water levels, High water mark, Low water mark, Streamflow, Discharge (Water), Floods, Droughts, Snow, Ice, Ice breakup, Rivers, River basins, "Gaging stations, Flow measurement, Identifiers: *USSR, *Ukraine.

Investigations of long-period records of hydrolog-ic events in southwestern European Soviet Russia

Group 2E-Streamflow and Runoff

were based on historical data collected from natural hydrologic phenomena observed from the middle of the 10th century A.D. to the present day. Streamflow data include maximum and minimum water discharges in the Dnieper, Vistula, Danube, Dniester, Southern Bug, and Northern Donets River basins and in river basins located in southern steppes of the Ukraine. Regular discharge measurements at gaging stations in these regions were begun on large and moderate-sized rivers in the 1870's and on small rivers in the 1920's. (Josefson-USGS) were based on historical data collected from natu-W73-07684

SOME RESULTS OF FULL-SCALE STUDIES OF CHANNEL FLOW TURBULENCE, For primary bibliographic entry see Field 08B. W73-0768

WAVE RESONANCE NEAR SHORES, Wisconsin Univ., Madison. Dept. of Mathematics. M. C. Shen.

M.C. Snen. In: Waves on Beaches and Resulting Sediment Transport, 1972, Academic Press, Inc., N.Y., p 123-161. 4 fig, 22 ref. OWRR A-037-WIS (7), 14-31-0001-3250 and 14-31-0001-3550.

Descriptors: *Physical properties, *Bodies of water, *Spectral analysis, *Frequency, *Dimensions, *Shorelines, *Beach erosion, *Waves

The purpose was to develop a systematic method for calculating the resonance frequencies of water bodies with shorelines as generally encountered in oceanographical or hydraulic problems. The approach is based upon the so-called geometrical optics method, or ray method. The ray method for surface waves is described as follows. A property ues memod, or ray memod. The ray memod to surface waves is described as follows. A propaga-tion velocity, or phase velocity, of waves of a given period is first defined at each point of the equilibrium surface of the water. This velocity is equilibrium surface of the water. This velocity is just that which waves of the given period would have in water of uniform depth equal to that at the same point. By using the phase velocity and basic principles in geometrical optics, a group of rays can be defined, along which surface waves are assumed to propagate. The variation of the amplitude of these waves along a ray is then determined by means of the principle of conservation of energy. The curves along which the phase of a wave is constant, are called wave fronts and orthogonal to the rays. If we follow a closed path formed by a congruence of rays due to the successive reflections from the boundaries of a water body, or the refractions caused by the bottom body, or the refractions caused by the bottom topography, the total increment of the phase should vanish. This condition then gives rise to a system of equations to determine the resonance frequencies. W73-07724

2F. Groundwater

A HYDROGEOLOGIC INVESTIGATION OF THE LEE FARM AREA, SOUTH COVENTRY, CONNECTICUT, Connecticut Univ., Storrs. Inst. of Water

For primary bibliographic entry see Field 04B. W73-07167

GROUNDWATER LEVELS AND PUMPAGE IN THE EAST ST. LOUIS AREA, ILLINOIS, 1967-

11971, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 04B. W73-07253

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1969-1970, Geological Survey, Oklahoma City, Okla.

For primary bibliographic entry see Field 04B. W73-07254

PRELIMINARY REPORT ON THE WATER RESOURCES OF CENTRAL MAUI, HAWAII, Geological Survey, Honolulu, Hawaii. For primary bibliographic entry see Field 04B. W73-07276

GROUNDWATER ZONING IN WATER RESOURCES MANAGEMENT, Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 04B. For primary W73-07335

LARGE-SCALE GROUND-WATER DEVELOP-

MENT.
United Nations Water Resources Development
Center, New York.
For primary bibliographic entry see Field 04B.
W73-07349

ECONOMIC EVALUATION OF REYKJANES ECONOMIC EVALUATION OF REYKJANES THERMAL BRINE AREA, ICELAND, National Energy Authority, Reykjavik (Iceland). S. Bjornsson, S. Arnorsson, and J. Tomasson. American Association of Petroleum Geologists Bulletin, Vol. 56, No. 12, p 2380-2391, December, 1972. 9 fig, 4 tab, 8 ref.

Descriptors: *Brines, Economics, Economic feasibility, *Energy, Geothermal studies, Basalts, Exploration, Drilling, Volcanoes, Hydrothermal studies, Chemical analysis, Surveys, Resistivity, Logging (Recording), Saline water, Hot springs.
Identifiers: *Iceland, *Thermal brines.

The Reykjanes thermal brine area is in southwesternmost Iceland on the subaerial continuation of the Reykjames ridge. This area is unique among thermal areas for its fluid composition. In the reservoir, where temperatures are between 250 and 250 degrees C., the brine has the same salinity as seawater. Surface activity covers an area of 1 sq. km., and a resistivity survey indicates that the system is of similar area above 900 m. within the hyaloclastite formation where it is surrounded by cold groundwater of seawater composition. By contrast, the system is more extensions. position. By contrast, the system is more extenposition. By contrast, the system is more extensive in the underlying bassalt formation consisting of lava flows and thick interbeds of hyaloclastites and sediments. Because of its temperature and composition, feasibility studies indicate that the brine could be exploited economically for the production of NaCl, KCl, CaCl2, and possibly other components. Aquifers are abundant in the basalt formation. It therefore is recommended that production wells penetrate to depths of about 2,000 m. to withdraw brine within this permeable formation, so as to ensure highest mass flow and minimize risk of cold seawater intrusion. (SmithNWWA) W73-07359

PRELIMINARY EVALUATION OF INFILTRA-FALLIMINARY EVALUATION OF INFILTRA-TION FROM THE MIAMA CANAL TO WELL FIELDS IN THE MIAMI SPRINGS-HIALEAH AREA, DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 04A. W73-07362

WATER LEVELS IN OBSERVATION WELLS IN THE TATUM SALT DOME AREA, 1961-65, LAMAR COUNTY, MISSISSIPPI, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B.

EXPLORATION AND EXPLOITATION OF GEOTHERMAL RESOURCES IN ARID AND SEMIARID LANDS, A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY. Arizona Univ., Tucson. Office of Arid Lands Stu-

Available from the National Technical Informa-tion Service as PB-218 830, \$5.45 in paper copy, \$0.95 in microfiche. Arid Lands Resource Infor-mation Paper No. 2, 1973, 119 p. 102 ref. OWRR W-141 (2), 14-31-0001-3729.

Descriptors: "Bibliographies, "Exploration, "Environmental effects, "Geothermal studies, "Thermal power, Steam, Brines, Legal aspects, Resources development, Drilling, Test wells, Salinity, Waste water disposal, Heat flow, Terrain analysis, Pressure, Injection wells, Land subsidence, Greenhouses, Benefits, Cost-benefit analysis, Project planning, Comparative benefits, Comparative costs, Design data, Forecasting. Identifiers: Geothermal Steam Act 1970, Dry steam fields, Impurities, Geysers Field (California), Valle Caldera, Cerro Prieto Field, Imperial Valley, Salton Sea.

Contemporary techniques for exploration of geothermal resources are outlined, with particular emphasis on the western U.S. as typical of problems encountered in arid and semiarid lands. These include field reconnaissance, infrared aerial nesse menude reconnaissance, mirared aernai reconnaissance, photogeologic mapping, drilling, geochemical analyses of groundwater, application of fluid dynamics to natural steam systems, elec-trical prospecting, seismic, gravity, and magnetic surveys. Environmental impacts, including noise, odors, subsidence, and legal problems involving odors, subsidence, and legal problems involving developmental regulations, are reviewed. The advantages of cheap power, multiple use including greenhouse agricultural production and dilution of present saline irrigation water sources, power for cooling and heating are discussed. A 102-item computerized bibliography, most with full abstracts, is included, plus author index, and a detailed computerized keyword index constructed from terminology applied to each citation from the Water Resources Scientific Center's Water Resources Thesaurus, 2nd ed. Reference is made throughout the text to these citations. (Paylorethroughout the text to these citations. (Paylore-Arizona)
W73-07420

SIMULATION OF WATER RESOURCES SYSTEMS WITH SPECIAL EMPHASIS ON GROUNDWATER. For primary bibliographic entry see Field 02A. W73-07432

AN INTRODUCTION TO FINITE DIFFERENCE METHODS AS APPLIED TO GROUNDWATER PROBLEMS.
Nebraska Univ., Lincoln. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-07434

ANALOG MODELS, Nebraska Soil and Water Conservation Commis-For primary bibliographic entry see Field 02A. W73-07435 sion, Lincoln

FINITE ELEMENT METHODS, Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 02A. W73-07436

SIMULATION OF GROUNDWATER SYSTEMS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-07437 SOLUTION OF PROBLEMS ON INFILTRA-TION WITH SIMULTANEOUS CONSIDERA-TION OF THE FLUID MOVEMENT BOTH IN SATURATED AND UNSATURATED ZONES OF

THE SOIL, Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR). For primary bibliographic entry see Field 02G. W73-07533

HYDRAULIC MODEL STUDY FOR IN-VESTIGATING KARSTIC WATER MOVE-MENTS, Research Inst. for Water Resources Development,

Research inst. To water resources bevelopment, Budapest (Hungary). B. Tivadar. In: Hydraulic research and its impact on the en-vironment; Proceedings of 14th Coagress of Inte-national Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 461-475, 1972 (release date). 2 fig. 6 ref.

Descriptors: *Karst hydrology, *Groundwater movement, *Hydraulic models, Karst, Limestones, Laminar flow, Turbulent flow, Reynolds number, Hydraulic radius.

For studying the hydraulic features of fissured karstic rocks, the term fictitious fissured karstic karstic rocks, the term includes insured karstic rock was introduced. Experiments were carried out with the hydraulic models of fictitious rock in order to determine the occurrence of laminar and transient flow. Linear relationships are valid at Re less than 50. In the model, rock elements consistapart, with the fractures intersecting each other at right angles. (Knapp-USGS) W73-07539 ing of smoothwalled fractures are spaced 5 cm

GEOLOGIC CLASSIFICATION OF AQUIFERS, Texas A and M Univ., College Station. Dept. of

m

Geology. H. R. Blank, and M. C. Schroeder. Ground Water, Vol 11, No 2, p 3-5, March-April 1973. 4 ref.

Descriptors: "Hydrogeology, "Aquifer characteristics, "Rock properties, Aquifer systems, Artesian aquifers, Joints (Geologic), Structural geology, Faults (Geologic), Fractures (Geologic), Folds (Geologic), Tactures (Geologic), Eductifiers: "Aquifer classification.

A classification of aquifers is based upon the properties of rocks which affect groundwater. Rocks are either consolidated or unconsolidated. They may be uniform in lithology, or they may consist of alternating layers of different lithologies. They may have been tilted, fractured, or altered in various ways since their formation. Consequently the occurrence of groundwater depends not only on the fundamental nature of the rocks but also on their geologic history. The groundwater may be found under confined (artesian) or unconfined (water table) conditions. The permeability of an aquifer may be uniform, or it may vary in some regular way, or it may be very irregular because most of the water is in secondary openings. (K-napp-USGS)

BACTERIAL MOVEMENT THROUGH FRAC-

BACTERIAL MOYEMBER TURED BEDROCK,
Colorado State Univ., Ft Collins. Dept. of
Microbiology.
For primary bibliographic entry see Field 05B. For primary W73-07675

SALT WATER INTRUSION IN THE SUMMER-

SIDE AREA, P.E.I., Ground Water Technical Services, Inc., Quebec. For primary bibliographic entry see Field 02L. W73-07677

DIGITAL SIMULATION OF AN OUTWASH AQUIFER, Nova Scotia Dept. of Mines, Halifax.

Ground Water, Vol 11, No 2, p 38-43, March-April 1973. 7 fig, 11 ref.

Descriptors: *Simulation analysis, *Hydrogeology, *Alluvium, *Water yield, Glacial drift, Canada, Artesian aquifers, Confined water, Water balance, Hydraulic conductivity, Mathematical models. Identifiers: Elmsvale (Nova Scotia)

Identifiers: Elmsvale (Nova Scotia).

A digital model simulates the groundwater flow through a confined aquifer discretized by a nonuniform mesh, using the noniterative alternating direction implicit method. The model results were checked closely with the analytical Thesis solution for a homogeneous, isotropic aquifer. The use of the model reduces computer core storage and execution time requirements, provides a closer and better replica of the aquifer boundaries, and may be used to examine concentrated areas of interests in the aquifer system. The model was applied as a test case to the isolated sand and gravel aquifer at Elmsvale, Nova Scotia, Canada. With the superposing Musquodoboit River providing a source of recharge to the system, the Elmsvale aquifer would reach an equilibrium after 51 days of continuous pumping at a rate of 0.670 cubic feet per second. Available information suggests that the groundwater resources potential in the Musquodoboit River Valley is more than sufficient to meet the demand of the valley in the foreseeable future. (Knapp-USGS)

2G. Water in Soils

EFFECT OF IRRIGATION ON FERTILIZER NITROGEN IN ARABLE CLAY SOIL, Helsinki Univ. (Finland). Dept. of Agricultural Chemistry. A. Kaila, and P. Elo

Acta Agral Fenn. 123: p 126-135. 1971. Illus. Identifiers: *Irrigation effects, Arable soil, Clays, *Fertilizers, Irrigation, *Nitrogen, Soils, Wheat

M.

Soil samples collected during the growing period from a field trial with spring wheat were studied. In addition to 16 kg N/ha as the basal dressing, 120 kg N/ha was applied as NH4NO3 lime or as urea, either on the surface, or in rows at the depth of 8 cm. Three weeks after sprouting, 30 mm of water was applied, and another 30 mm 8 days later. In samples collected 1 wk before the first irrigation, the NH4-N content was highest in the surface layer. There was a distinct accumulation of NO3-N in the top (0-5 cm) layer not only when the N fertillizers were applied as a surface dressing, but even when they were placed at a depth of 8 cm. The content of NO3-N in the top layer of the nonirrigated plots remained fairly high until the end of the trial, though the rains in July decreased the concentration. Irrigation reduced markedly the accumulation of NO3-N in the surface layers. The recovery of fertilizer N as plant N and as easily extractable mineral N in soil tended to be somewhat lower from the irrigated than from the nonirrigated. lower from the irrigated than from the nonirrigate plots.--Copyright 1972, Biological Abstracts, Inc. W73-07183

SUCCESSIVE DISPLACEMENTS OF (3) H2O AND (36) NACL THROUGH STERILIZED AND UNSTERILIZED SOIL COLUMNS,

Florida Univ., Gainsville. R. S. Mansell, A. Elzeftawy, and P. G. Hunt. Soil Science, Vol 115, No 2, p 113-119, February 1973, 5 fig, 1 tab, 10 ref. OWRR-A-013-FLA (6).

Descriptors: *Soil water movement, *Ion transport, *Retention, *Soil bacteria, Saturated flow, Tracers, Radioisotopes, Laboratory tests, Tritium, Chlorides.

Aqueous solutions with Na-36 and H-3 were displaced through sterile and nonsterile columns of water-saturated soil to evaluate any effects of sterilization upon retention and movement of C1 and water. Successive tritium breakthrough curves for the sterilized soil showed almost complete recovery, but for the unsterilized soil, recovery decreased with each addition applied. The phenomenon was directly related to rapid growth of microorganisms in the nonsterile soil. The breakthrough curves for tritiated water behaved similarly when C1 and tritiated water were applied as three successive additions to another nonsterile column. A definite separation was observed for C1 and tritium curves. The tritiated water lagged behind chloride in the effluent. The proportionality between uptake of soil-applied H2O and microbial activity offers a potential method for conveniently monitoring microbial activity within a flowing soil-water system. (Knapp-USGS)

A COLUMN CATION-EXCHANGE-CAPACITY PROCEDURE FOR LOW-EXCHANGE-CAPA-CITY SANDS, Battelle-Pacific Northwest Labs., Richland,

wash.
For primary bibliographic entry see Field 02K.
W73-07248

PERCOLATION RATE AS AFFECTED BY THE INTERACTION OF FREEZING AND DRYING PROCESSES OF SOILS, Department of Agriculture, Swift Current (Saskatchewan). Research Station.
W. C. Hiaman, and F. Bisal.
Soil Science, Vol 115, No 2, p 102-106, February 1973. 1 fig, 5 tab, 9 ref.

Descriptors: "Percolation, "Drying, "Freezing, "Soil water movement, Moisture content, Thawing, Wetting, Clays, Frost. Identifiers: "Freeze drying.

The effect of freezing action on the relative percolation rate of water in soil is influenced by the initial moisture content and the method of subsequent drying. In laboratory tests, the rate decreased with increasing moisture content at time of freezing, but length of time in the frozen state was not significant. The effect of alternate freezing and thawing on percolation rate depended on the initial moisture content. At low moisture content (15 atm.) no change occurred. At field capacity (0.33 atm.) the rate increased At high moisture content (0.1 atm.) the rate decreased. The rate was lower after freeze-drying than after air-drying at room temperature. The increase in the percolation rate when the initial moisture content was at field capacity was apparently due to more stable aggregation of the fine soil particles. The decrease at high initial moisture content and after freeze-drying was apparently due to the destructive effect of these processes on soil aggregation. (Knapping was processes on soil aggregation. (Knapping was processes) these processes on soil aggregation. (Knapp-USGS) W73-07249

THE RELATIONSHIP OF METHOXYCHLOR TO PERIPHYTON PRODUCTION UNDER LABORATORY AND SEMI-NATURAL CONDI-

TIONS, Michigan Univ., Ann Arbor. School of Natural

Resources.

W. C. Latta, and R. L. Weitzel.

Available from the National Technical Information Service as PB-219 055, \$4.50 paper copy, \$0.95 in microfiche. Institute of Water Research, Michigan State University, Project Completion Report, March 1973. 48 p, 6 fig. 1 tab, 23 ref. 2 append. OWRR A-053-MICH (1)-14-31-0001-3522.

Descriptors: "Periphyton, "Primary productivity, Bioassays.
Identifiers: "Methoxychlor, Periphyton species associations, Methanol/Triton X-100 carrier solution, Serial diluters.

Group 2G-Water in Soils

The pesticide, methoxychlor, in a carrier solution of methanol and Triton X-100, was applied to periphyton communities grown under conditions of continuous flow laboratory bioassay using a of continuous flow laboratory bioassay using a natural water supply. A replicated experiment with controls and pesticide levels of 0.125 ppb, 0.25 ppb, 0.5 ppb, 1.0 ppb and 2.0 ppb was designed. A parallel experiment with controls utilized carrier solution levels (absent of methoxychlor) equivalent to the 0.25 ppb and 2.0 ppb pesticide levels. In both experiments, dry weight and organic weight production (g/m2/day) progressively increased from the controls through the 1.0 ppb levels and decreased from the 1.0 ppb level to the 2.0 ppb level. Analysis of chlorophyll a production (mg/m2/day) showed an initial increase in productivity from the control to the 0.25 ppb pesticide level after which there was a progressive decrease through the 2.0 ppb level. The parallel experiment which dosed the carrier solution by itself indicated a progressive decrease in chlorophyll a production from the control to the 2.0 level. There appeared to be greater similarity between species associations be greater similarity between species associations of the 2.0 ppb pesticide levels and equivalent carrier solution levels than when species associations from dosed levels were compared with the control associations. The data suggest that the methanol/Triton X-100 carrier solution by itself as well as methoxychlor in the carrier solution affected periphyton communities by inhibiting algal species or chlorophyll production, and selected for a nonalgal community. W73-07429

OILY WASTE DISPOSAL BY SOIL CULTIVA-

TION PROCESS, Shell Oil Co., Deer Park, Tex. Houston Lab. For primary bibliographic entry see Field 05B.

BIOLOGICAL PRODUCTIVITY OF SOIL, (IN RUSSIAN), Moscow State Univ. (USSR).

V. A. Kovda, T. I. Evdokimova, L. A. Grishina, E. M. Samoilova, and V. D. Vasil'evskaya.

Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 26, Wo 4, p 3-12, 1971.
Identifiers: *Biological productivity, Energy, *Humus, *Soil properties.

The total reserves of energy which are bound in the humus of the soil cover exceed the reserves of energy accumulated by the aerial part of the phytomass or are equal to them (respectively, n.10 (19-20) and n.10 (19) kcal). The soil cover, and (19-20) and n.10 (19) Keal). The soil cover, and especially the humus shell of land and shoals, is a planetary accumulator and distributor of energy which has accumulated through photosynthesis, and retains the most important biophilic elements, thus preventing their geochemical runoff into the oceans.—Copyright 1972, Biological Abstracts, W73-07438

CROP RESPONSE TO EXCESSIVE ZINC FER-TILIZATION OF ALKALINE SOIL, Agricultural Research Service, Prosser, Wash. For primary bibliographic entry see Field 03F. W73-07445

SOLUTION OF PROBLEMS ON INFILTRA-TION WITH SIMULTANEOUS CONSIDERA-TION OF THE FLUID MOVEMENT BOTH IN SATURATED AND UNSATURATED ZONES OF THE SOIL.

Ysesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR). N. I. Druzhinin, and S. V. Nerpin.

N.I. Druzhini, and S. V. Nerpin.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 411-414, 1972 (release date). 14 ref.

Descriptors: *Infiltration, *Saturated flow, *Un-saturated flow, *Water chemistry, Soil water movement, Water temperature, Salinity, Drainage effects, Drainage programs, Soil moisture, Groundwater movement.

Groundwater movement.

A general approach to solving infiltration problems requires a simultaneous solution of equations describing the processes of energy and mass transfer in a complex system embracing all the zones of water movement both in the liquid and vaporous phases. The motive forces in the system considered are the potential gradients of various fields, such as gravitational, electric, pressure, temperature, and concentration of the dissolved substances. In solving many practical tasks it often appears possible to simplify the problem by neglecting some factors of secondary importance for the particular case. One such problem allowing a considerable simplification of the general system of water transfer equations is a calculation of infiltration at relatively low temperature gradients in the zone of water movement, with nonsaline soils, in the absence of an artificially created electric field, and when phase transitions are insignificant. The problem still remains complicated if the conditions at the boundaries of the soil massive cannot be imposed and should be taken into account by the equations in adjoining zones. Simultaneous consideration of the fluid movement in the saturated and unsaturated zones, along the conditions and unsaturated zones. ovement in the saturated and unsaturated zon taking into account the convective and diffusive salt transfer, makes it possible to forecast the phenomena of secondary salinity and to develop methods for irrigation and draining the land. (Kmapp-USGS) W73-07533

ON THE DETERMINATION OF HYDRAULIC CONDUCTIVITY OF UNSATURATED SOILS IN

SITU, Technical Univ. of Istanbul (Turkey). Div. of Hydraulic and Water Power. K. Cecen.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 415-420, 1972 (release date). 4 fig, 7 ref.

Descriptors: "Hydraulic conductivity, "Infiltra-tion, "On-site tests, "Hydraulic models, Flow nets, Infiltrometers, Lysimeters, Soil water move-ment, Unsaturated flow, Hydrographs, Permea-bility, Water balance. Identifiers: Hele-Shaw models.

Axisymmetrical potential flow fields of water infiltrating into unsaturated soil under a constant head from sources at various distances from the water table may be determined by a graphical method, and the results are unified by using a suitable scale. The validity of the solution was examined for the case of partly saturated soils, and the relafor the case of partly saturated soils, and the rela-tion between the required head and the type of the soil was investigated. Experiments were carried out in a sand box with various granular materials. The results obtained for the axisymmetrical flow The results obtained for the axisymmetrical flow were verified by a viscous flow model. Determina-tion of hydraulic conductivity in situ by using a constant head of water in a pipe gives good results, especially when the water table is high and the soil is relatively permeable. (Knapp-USGS) W73-07534

VERTICAL INFILTRATION DUE TO CONSTANT RAINFALL INTO NON-SATURATED SOILS, Osaka Univ. (Japan).

Osaka Univ. (Japan).

A. Murota, and K. Sato.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of Intenational Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 421-424, 1972 (release date). 5 fig.

Descriptors: *Hydraulic conductivity, *Infiltra-tion, *On-site tests, *Hydraulic models, Flow nets, Infiltrometers, Lysimeters, Soil water move-ment, Unsaturated flow, Hydrographs, Permea-bility, Water balance.

The transmission of wetted fronts and the relation between infiltration rate and rainfall intensity with constant moisture and constant water conductivity were studied using a one-dimensional model. The infiltration process is classified in three stages; (1) increasing head stage; (2) constant head stage; and (3) decreasing head stage. In each stage the theoretical solutions are given for the front depth and the head of surface storage. Based on some experimental results, the validity of theoretical investigation is confirmed, despite ignoring the capillary effect. (Knapp-USGS) W73-07535

METHOD OF EVALUATION OF WATER BALANCE IN SITU USING WATER CONTENT AND INTERSITIAL PRESSURE (METHODE D'EVALUATION DU BILAN HYDRIQUE IN SITU A PARTIR DE LA MESURE DES TENEURS EN EAU ET DES PRESSIONS IN-TERSTITIELLES), Universite Scientifique et Medicale de Grenoble

Onversus Scientifique et Medicale de Grenoble (France).

J. F. Daian, and G. Vachaud.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 429-438, 1972 (release date). 5 fig, 8 ref.

Descriptors: "Hydraulic conductivity, "Infiltra-tion, "On-site tests, "Hydraulic models, "Water balance, Flow nets, Infiltrometers, Lysimeters, Soil water movement, Unsaturated flow, Hydro-graphs, Permeability, Water balance.

A method is presented for direct evaluation of the transfer of water between the atmosphere and a water-table aquifer in a field situation. The method uses the volume of rainfall, infiltration, and evaporation in the unsaturated zone to obtain the water budget and to predict quantitatively the recharge of surface aquifers. Soil-water content and soil-water potential are measured independently using a neutron probe and an automatic recording device. The frequencies of data are a daily soil water profile and hourly water potential profile. Using the flow equations in the unsaturated zone, the integration of water content profiles yields changes of water storage as well as water flow velocity at different levels in the soil profiles. Interpretation of data is discussed. (Knapp-USGS) A method is presented for direct evaluation of the napp-USGS) W73-07536

CONSTANT FLUX INFILTRATION IN A VER-CUNSTANT FLUX INFILITATION IN A VER-TICAL COLUMN OF STRATIFIED SOIL— INFILIENCE OF THE COMPRESSION OF AIR (INFILITATION A DEBIT CONSTANT DANS UNE COLONNE VERTICALE DE SOL STRATIFIEE—INFILIENCE DE LA PRESSION DE L'AIR), G. Vachaud, M. Vauclin, M. Wakil, and D. Khanji.

G. Vacchaud, M. Vauch, M. Wakil, and D. Khanji. In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydrualic Research, Paris, August 29-September 3, 1971, Volume 5, p 439-448, 1972 (release date). 4 fig, 9 ref.

Descriptors: *Soil water movement, *Infiltration, *Infiltrometers, Hydraulic models, Laboratory tests, Rainfall simulators, Unsaturated flow, Air-

The effect of air pressure was studied during con-stant flux infiltration in a vertical stratified column of unsaturated soil. Water pressures were mea-sured simultaneously at the different levels in the column, using tensiometers associated with pres-sure transducers. Experiments used a soil column

built with three layers of soils: fine sand over coarse gravel, over fine sand. For a rain with an intensity of 3 cm/hr, the air pressure can reach locally a value higher than 50 mb after 3 hours. It is necessary to correct the water pressure measurements for obtaining the value of the water suction. The mechanism of air compression can be explained by the behavior of the evolution of water profiles. The compression of the air phase has a strong influence on the flow process. The air compression effect must be known for determining the water suction. (Knapp-USGS)

SEEPAGE THROUGH UNSATURATED POROUS MEDIA, Research Inst. for Water Resources Development,

Budapest (Hungary).

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G. Kovacs.
In: Hydraulic research and its impact on the environment, Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 449-456, 1972 (release date). 2 fig, 17 ref.

Descriptors: *Infiltration, *Soil water movement, *Unsaturated flow, Mathematical models, Seagney, Surface tension, Evaporation, Water vapor, Adhesion.

A conceptual model for infiltration consists of a A conceptual model for infiltration consists of a bunch of straight pipes. The model is hydraulically equivalent to the channels of straight pipes. The model is hydraulically equivalent to the channels of pores between the grains of a layer of soil. Dynamically this type of seepage can be charac-terized by effects of gravity and molecular forces as main accelerating forces. The dominant re-sistive forces are friction and adhesion. The flow it very complicated because there is a possibility sistive forces are friction and adnesion. The flow is very complicated because there is a possibility of water movement not only in the liquid phase but in the vapor phase. The thickness of the water film and the surface tension varies continuously with water movement. Steady movement can develop only rarely, because the variable effect of surface tension is one of the dominant forces. (Knapp-ISGS) W73-07538

STRENGITE DISSOLUTION IN FLOODED SOILS AND SEDIMENTS, Louisiana State Univ., Baton Rouge. Dept. of

For primary bibliographic entry see Field 05B. W73-07595 Agronomy.

GAS CHROMATOGRAPHIC STUDIES OF SORPTIVE INTERACTIONS OF NORMAL AND HALOGENATED HYDROCARBONS WITH WATER-MODIFIED SOIL, SILICA, AND

CHROMOSORB W, California Univ., Riverside. Dept. of Chemistry. For primary bibliographic entry see Field 05B. W73-07627

A STUDY ON DENSITY AND SPECIES OF AZOTOBACTER IN SOIL, WATER, AND LEAF SAMPLES FROM SOUTHERN IRAQ, RESIDENCE FROM SUUTHERN IRAQ, Institute for Applied Research on Natural Resources, Baghdad (Iraq). For primary bibliographic entry see Field 05B. W73-07645.

A THEORY ON THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: III. EXACT SOLUTION FOR FIRST-ORDER KINETIC SORBTION,

Oregon State Univ., Corvallis. F. T. Lindstrom, and L. Boersma. Soil Science, Vol 115, No 1, p 5-10, January 1973. 6 tab. 9 ref.

Descriptors: "Path of pollutants, "Leaching, "Diffusion, "Dispersion, "Porous media, Groundwater movement, Soil water movement, Sorption, Ion exchange, Water chemistry, Kinetics, Clays.

The mass transport of chemicals in porous media is analyzed, based on the assumption that instantaneous point-wise equilibrium exists between the free and sorbed phases of chemicals being 'leached' or dispersed in a water-saturated sorbing porous medium. Numerical solutions are reviewed for three kinetic models of sorption combined with free-phase dispersion. An exact solution is given for the case of first-order sorption kinetics. It is based on methods used in generating the Greens function. (See also W72-03459) (Knapp-USGS)

POTENTIAL OF ERODING SOILS FOR THE PHOSPHORUS ENRICHMENT OF STREAMS, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 05B.

EVALUATION OF HAZARDS AND CORRO-SION OF BURIED WASTE LINES IN NA-TIONAL REACTOR TESTING STATION SOILS, Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office. For primary bibliographic entry see Field 05B. W73-07775

2H. Lakes

INVESTIGATION OF A NORTHEASTERN WISCONSIN LAKE ECOSYSTEM: AN INTER-DISCIPLINARY APPROACH. PHASE I - AP-PROACH AND PRELIMINARY SURVEY, Wisconsin Univ., Green Bay.

T. W. Thompson, A. J. Bedrosian, J. E. Berry, R. B. Ditton, and J. W. Kolka.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-218 695, \$3.00 in paper copy, \$0.95 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, December, 1972, 44 p, 9 fig. 5 tab, 17 ref, 2 append.

Descriptors: *Attitudes, Economics, Lakes, *Social aspects, *Decision making, Watershed management, *Aquatic weeds, Camping, Water sports, Environmental effects, Ecosystems, *Wisconsin, Recreation.

Identifiers: *Caldron Falls Reservoir, *Lake

Noquebay, Marinette County (Wis).

The first year of a program designed to test procedures and develop approaches for inter-disciplinary, problem-oriented research is described through the examination of the problems encountered in a northeastern Wisconsin recreational lake. The program was initiated to provide viable alternative resource management province viable anternative resource management strategies. The first phase of the project included a determination of the nature of the lake from in-vestigations of the biology, chemistry and economics of the lake basin. The biologicalproblems associated with the lake and the societal difficulties in achieving a solution to the problem are discussed. The requirements placed upon academic institutions engaged in interdisciplinary problem-oriented research programs are outline W73-07162

A PHYSICAL CHEMICAL AND BAC-TERIOLOGICAL ANALYSIS OF FRESH-WATER LAKES IN THE SCHIERMACHER OA-SIS, (IN RUSSIAN), For primary bibliographic entry see Field 05C. For primary W73-07166

COMPARATIVE LIMNOLOGY PHYTOPLANKTON ECOLOGY OF FOUR OLIGOTROPHIC' LAKES IN OREGON, U.S.A., WITH EMPHASIS ON LAKE TYPOLOGY, Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife. For primary bibliographic entry see Field 05C. W73-07172

LAKE GENEVA, WALWORTH COUNTY: AN INVENTORY WITH PLANNING RECOMMENDATIONS.

Wisconsin Dept. of Natural Resources, Madison. For primary bibliographic entry see Field 06B. W73-07178

DYNAMICS OF NUTRIENT SUPPLY AND PRI-MARY PRODUCTION IN LAKE SAMMAMISH, WASHINGTON, Washington Univ., Seattle. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 05C. W73-07195

SUGARS IN THE SEDIMENTS OF LAKE TRUMMEN AND REFERENCE LAKES, Lund Univ. (Sweden). Limnological Inst. For primary bibliographic entry see Field 05C. W73-07197

RESULTS OF AERIAL TABULATIONS AND AERO-PHOTOGRAPHS OF SOCKEYE AND THEIR SPAWNING GROUNDS IN THE BASIN OF LAKE KURIL, (IN RUSSIAN), For primary bibliographic entry see Field 07B. W73-07202

DEVELOPMENTAL STAGES OF ROACH IN ARAKUMSK BODIES OF WATER, (IN RUS-

SIAN), K. A. Adzhimuradov. Sb Nauchn Soobshch Kafedry Fiziol Cheloveka Zhivotn Zool Biol Khim Dagest Univ. 4. p 40-48.

Identifiers: *Fish growth, Arakumsk, Development, *Roach, Spawning, USSR, Growth stages.

ng was observed at 9-21 deg. from the beginning of April to the middle of May. The main spawning grounds were Lakes Kutlakai, Vi-lyuchee and Kushevatoe. Two embryo stages were systeme and knaivevator. We should you stages of juveniles up to the downstream migrant stage. No great differences were observed between the body weight and proportions of Arakumsk roach and roach from other bodies of water. The first pair of intestinal consultations developed the second transport of the stage of the stage of the second transport of the second tr intestinal convolutions developed a stage earlier than in northern roach.-Copyright 1972, Biological Abstracts, Inc. W73-07205

BOTTOM FAUNA AND COOLING WATER DISCHARGES IN A BASIN OF LAKE

MALAREN, Uppsala Univ. (Sweden). Inst. of Zoology. For primary bibliographic entry see Field 05C. W73-07214

FES-CONCRETIONS IN THE LAKE OF CON-STANCE, (IN GERMAN), Staatl Institut fuer Seenforschung und Seenbe-wirtschaftung, Langenargen (West Germany). For primary bibliographic entry see Field 05C. W73-07216

ON THE REGENERATION OF NORTHEU-ROPEAN BOGS: I. KLAUKKALAN ISOSUO IN S. FINLAND, Helsinki Univ. (Finland). Dept. of Botany.

Group 2H-Lakes

Acta Agral Fenn. 123 p 143-166. 1971. Illus. Identifiers: *Bops. Call Identifiers: *Bogs, Caliuna-D, Climate, Eriophorum-Vaginatum-M, European, *Finland, Isosuo, Klaukkalan, *Regeneration, Sphagnumn. *Peat strats

The striated structure characterizing the peat strata of the raised bog Klaukkalan Isosuo originates from vertical alternation of highly humified peat streaks rich in Calluna, Eriophorum vaginatum and lichens, and slightly humified Sphagnum peat (usually S. fuscum) with lower residues of the vascular plants. After the peat growth stopped during streak formation, deposition of light-colored Sphagnum layers occurred. A S. fuscum sward was usually responsible for the rejuvenation of the peat surface. Regeneration in that it differs clearly from the regeneration, in that it differs clearly from the regeneration by total absence of the hollow phase in the cycle. A closely similar system on Irish bogs is called 'short cycle regeneration'. On account of the more or less fragmentary and nonsynchronous character and great mentary and nonsynchronous character and great number of the dark streaks (about 25 in the abiegnic time interval of 3500-4000 yr), they do not correspond to the so-called recurrence surface (rekurrensytor), which are only eight in number. (rekurrensytor), which are only eight in number. Some of the present streaks may be recurrence surfaces, while the majority constitute evidence of minor fluctuations in the macroclimate (especially in regard of humidity). If the recurrence levels were directly correlated with the long-term periodic (1500 yr) fluctuations in the tide water curve and with the climatic phenomena, the rest of the streaks could be explained by smaller water oscillations. It is possible that the lifecycles of the dominant plant species mentioned in themselves offer a simple explanation. A similar streak system occurs more or less clearly in the entire raised bog region. The detailed manner in which such S. fuscum regeneration, or short-cycle regeneration, is caused by the natural growth rhythm of the bog, remains to be clarified by further studies.—Copyright 1972, Biological Abstracts, Inc. W73-07221

CALORIC VALUE OF FOOD ORGANISMS IN THE KREMENCHUG RESERVOIR, (IN RUS-

SIAN), Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

V. V. Sherstyuk V. V. Sheasyuk Gidrobiol Zh. Vol 7, No 6, p 99-103. 1971. Illus. Identifiers: *Caloric values, Crustaceans, Insects, *Invertebrates, *Kremenchug reservoir, Mol-lusks, Organisms, Plankton, Reservoirs, USSR.

The caloric value of invertebrates, including mollusks, crustaceans and plankton in the Kremenchug Reservoir was studied from 1967-69. The caloric value of organic substances from all plankton and from individual species varied from 3.94-6.47 kcal/g, and, averaged 5.07 kcal/g of organic matter. The caloric value of benthic organisms varied from 3.84-6.54 kcal/g. The greatest energy value was found in insect larvae, the lowest in mollusks.--Copyright (c) 1972, Biological Abstracts, Inc. W73-07222

MICROBIOLOGICAL PROCESSES IN LATVI-AN LAKES, (IN RUSSIAN),
For primary bibliographic entry see Field 05C.
W73-07228

TRANSFER IN A GULF COST ESTUARINE LAKE, Louisiana State Univ., Baton Rouge. Reacting Fluids Lab

Fluids Lab. S. Hacker, R. W. Pike, and B. Wilkins, Jr. In: Water-1971: American Institute of Chemical Engineers Symposium Series, Vol 68, No 124, p 147-156, 1972. 6 fig., 3 tab, 9 ref.

Descriptors: "Heat transfer, "Lakes, "Estuarines, "Heat balance, "Mathematical models, Convection, Heat flow, Water circulation, Systems analysis, Mass transfer, Conduction, Evaporation, Solar radiation, Radiation, Gulf coastal plain, Identifiers: *Airplane Lake (La), *Barataria Bay

Mathematical models of the mass, mor water/were developed from general conservation equations. A set of two-dimensional, time depen-dent, partial differential equations describe the transport of mass, momentum and energy in the estuary. Initial and boundary conditions were obtained from surface and bottom balances. Special functions to describe the air-water and water-bottom interactions were obtained from experimental measurements and the literature. Solutions of the hydrodynamic and energy transfer models are presented for a typical estuarine lake (Airplane Lake in the Barataria Bay estuary). Comparisons with experimental data establish the validity of the with experimental data est analyses. (Knapp-USGS) W73-07277

MOUNDS IN LAKE TAHOE, CALIFORNIA--NEVADA: A MODEL FOR LANDSLIDE TOPOGRAPHY IN THE SUBAQUEOUS EN-

VIRONMENT, Tulsa Univ., Oklahoma. Dept. of Earth Sciences. For primary bibliographic entry see Field 02J.

BENEFICIAL MODIFICATIONS OF THE MARINE ENVIRONMENT. For primary bibliographic entry see Field 02L. W73-07395

LIMNOLOGICAL INVESTIGATIONS OF THE DANUBE RIVER (LIMNOLOGICHESKIYE ISS-LEDOVANIYA DUNAYA). Akademiya Nauk USSR, Kiev. Instytut Hidrobiologii.

For primary bibliographic entry see Field 02E. W73-07413

LAKES OF THE KARELIAN ISTHMUS: LIM-NOLOGICAL CYCLES OF LAKE KRASNOYE (OZERA KAREL'SKOGO PERESHEYKA: LIM-TSIKLY NOLOGICHESKIVE Laboratory of Limnology, Leningrad (USSR),

Izdatel'stvo 'Nauka', Leningrad, K. A. Mokiyev-skiy, and I. I. Nikolayev, editors, 1971. 532 p.

Descriptors: *Limnology, *Lakes, *Cycles, *Water chemistry, *Aquatic environment, Aquatic life, Aquatic animals, Aquatic plants, Aquatic microorganisms, Biology, Hydrology, Hydraulics, Meteorology, Solar radiation, Thermal properties, Water properties, Water temperature, Water balance, Water levels, Seasonal.

Identifiers: *USSR, *Karelian Isthmus, *Lake

Krasnoye, Mineralization.

Hydrological, hydrochemical, and biological processes occurring in Lake Krasnoye in the Karelian Isthmus were investigated. This collec-Karelian Isthmus were investigated. This collection of 13 papers was prepared on the basis of research conducted in 1964-67 by the Laboratory of Limnology, USSR Academy of Sciences. Studies were made of the water balance, hydromechanics, thermal properties, and aquatic life of the lake. A bibliography of the Soviet literature on the lake is accompanied by an English translation of the Russian abstract for each paper in the collection. (Josefson-USGS) W73-07414

THE MEASUREMENT OF PLANKTONIC HETEROTROPHY AS AN INDICATOR OF EUTROPHICATION, Wayne State Univ., Detroit, Mich. Dept. of Biolo-

gy. For primary bibliographic entry see Field 05C. W73-07422

DIET OF PIKE IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN), T. V. Lugovaya. Rybn Khoz Mezhved Temat Nauchn Sb. 12. p 104-

110, 1971.

Identifiers: *Fish diets, Abramis brama, Blicca bjoerkna, Cyprinus, Esox, Kremenchung Reservoir, Pelecus cultratus, *Pike, Reservoirs, Rutilus, Stizostedion lucioperca, USSR.

Food of pike (Esox) was studied under different ecological conditions in the Kremenchugskii Reservoir. Fattening conditions were worse in the fluvial area of the reservoir compared to the lake-like area. Pile fed on commercially inferior fish, mostly roach (Rutilus), bream (Blicca bjoerkna) and perch. Pike which exceeded 50 cm ate valua-ble president of the and perch. Pike which exceeded 50 cm ate valuable species of fish to a large degree, including a predominance of bream (Abramis brama), chekhom (Pelecus cultratus), European pike-perch (Stizostedion lucioperca) and carp (Cyprinus). By eating the young of these fish, pike damage the industrial reserve. Therefore large pike should be caught, especially in the post-spawning period.—Copyright 1972, Biological Abstracts, Inc. W73-07443

DEVELOPMENTAL CONDITIONS FOR EGGS OF PHYTOPHILOUS FISH ON NATURAL SPAWNING GROUNDS IN THE RYBINSK RESERVOIR, (IN RUSSIAN),

L. K. Il'ina.
Tr Inst Biol Vnutr Vod Akad Nauk SSR. 21.24. 212-221. 1971.

Identifiers: *Fish eggs, *Aquatic environment, Development, Phytophilous fish, Reservoir, Rybinsk, Spawning, USSR.

Factors affecting the developmental conditions of phytophilous fish eggs-water temperature at spawning grounds, variations in water level and chemical activity of the water, were studied. Each factor varied within a range which was non-lethal factor varied within a range which was non-ternal for the eggs, though their combination in certain cases could be unfavorable. The location of spawning, exchange of water with neighboring areas, density of the flora and ferrous iron content of the soil were factors.—Copyright 1972, Biologi-W73-07469

TEMPERATURE FINE STRUCTURE IN LAKE

ONTARIO, Toronto Univ., (Ontario). Inst. of Environmental Sciences and Engineering.
A. H. Lee, and G. K. Rodgers

Limnology and Oceanography, Vol 17, No 5, p 672-677, September 1972. 4 fig, 1 tab, 13 ref.

Descriptors: *Temperature, *Thermal properties, *On-site tests, *Lake Ontario, Limnology, Oceanography, Stratification, Density, Flow, Oceanography, Stratification, Density, F. Great Lakes, Hydraulic properties, Isotherms.

The eastern basin of Lake Ontario was surveyed between May 19 and June 24, 1970, with a vertical temperature profiler, in order to ascertain the temperature fine structure of the lake. Although freshwater has a density maximum near 4 C and con-tains a far smaller amount of dissolved solids than tains a tar smaller amount of dissolved sonds than ocean water, the lake seemed to have no features which could be considered unique of freshwater. From features observed, freshwater temperature inversions can be defined as that part of the vertical temperature profile whose gradient has an algebraic sign opposite to that of the overall profile. Isothermal layers which range from 1-20 m in thickness were also noted in 5% of the traces taken. Finer subsurface layers ranging from 1-3 m were also noted in several traces, but these had such short life times they could not be adequately studied. Many structural similarities are noted between lake and ocean water bodies. (Jerome - Vanderbill) W73-07498

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GREAT LAKES SIMULATION MODEL—A
DECISION AID,
Department of the Environment, Ottawa (Ontario). Water Management Service.
For primary bibliographic entry see Field 06A.
W73-07530

SOURCES OF NUTRIENTS IN CANADARAGO

Now York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05B.
W73-07593

NATURAL PHOSPHATE SOURCES IN RELA-TION TO PHOSPHATE BUDGETS: A CON-TRIBUTION TO THE UNDERSTANDING OF EUTROPHICATION, Hydrobiologisch Instituut, Nieuwersluis (Nether-

lands). For primary bibliographic entry see Field 05C. W73-07619

BACTERIOLOGICAL WATER QUALITY CHARACTERISTICS OF FORT LOUDOUN

RESERVOIR, Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C. W73-07723

NUTRIENT ENRICHMENT AND EUTROPHI-CATION OF LAKE MICHIGAN, PROGRESS REPORT NOV. 1, 1968 TO JULY 31, 1972, Michigan Univ., Ann Arbor. Great Research Div. For primary bibliographic entry see Field 05C. W73-07765 Univ., Ann Arbor. Great Lakes

MODE OF LIFE AND COMPOSITION OF PELAGIC HYDROBIONTS IN THE GLDANI LAKES (IN RUSSIAN),

N. N. Chikvaidze. Soobshch Akad Nauk Gruz Ssr, Vol 64, No 2, p 481-484, 1971, English summary. Identifiers: *Gldani lakes, Salinity, Hydrobionts, Lakes, *Pelagic hydrobionts, USSR, Vegetation.

Morphometric characteristics of the lakes, their temperature at the time of observation, salinity, chemical composition of water, vegetation and specific composition of the hydrobionts are given.-Copyright 1972, Biological Abstracts, Inc. W73-07795

2I. Water in Plants

ECOLOGICAL MONITORING OF STREAM Michigan Univ., Ann Arbor. Dept. of Wildlife and

Fisheries. F. F. Hooper, S. G. Hildebrand, and W. P.

Available from the National Technical Informa-tion Service as PB-218 709, \$3.00 in paper copy, \$0.95 in microfiche. Institute of Water Research, Michigan State University, Project Completion Report, March 1973.

Descriptors: *Ecological distribution, Monitoring, *Streams, Invertebrates, Density, *Aquatic dust, *Michigan.
Identifiers: *Artificial stream system, *Pigeon River (Mich), Trout streams, Benthic samples.

In the controlled conditions established in an artificial stream system, the drift of all taxa examined was a linear function of population density. Drift was density related but not density dependent. Increased benthic density did not result in a higher proportion of the numbers in the substrate boxes being displaced downstream as drift. The range of densities used for the five taxa far exceeded the densities observed for these taxa in the Pigeon River. The observed linear relation of drift to density suggests that intraspecific competition for space is not a mechanism resulting in increased drift for the taxa examined. Drift appeared to be a function of a probability of dislodgement from the substrate which was not affected by density. In order to clarify the function of drift in invertebrate populations and determine the feasibility of drift order to clarify the function of drift in invertebrate populations and determine the feasibility of drift as a monitor tool, the relation between drift density and food level in artificial streams, drift density relations in a natural stream system, and the fate of drift in pools were investigated. One of the most significant findings was that differences in food level affected the drift of three of the four taxa examined in the artificial stream system. This observed drift response to changing food levels is encouraging evidence that for some taxa, drift rates do reflect changes in enrichment level. It is thus suggested that monitoring drift rates of taxa utilizing a food base altered in a stream by enrichment ing a food base altered in a stream by enrichment would be very useful in assessing enrichment stimulated density change.

ECOLOGICAL SEPARATION OF COEXISTING SPECIES OF WINTER STONEFLIES, AL-LOCAPNIA SPP. (PLECOPTERA: CAPNIDAE). Purdue Univ., Lafayette, Ind. Water Resources Research Center. For primary bibliographic entry see Field 05C. W73-07170

THE AGE AND GROWTH OF THE DACE, LEU-CISCUS LEUCISCUS (L.) IN THE OURTHE RIVER AND BERWINE STREAM,

Liege Univ. (Belgium). J.-C. Philippart. Ann Soc R Zool Belg. Vol 101 No 1/2, p 77-140.

Ann Soc R Zooi Beig, voi 101 No 1/2, p //-140. 1971. Illus. English summary. Identifiers: Belgium, Berwine stream, *Dace, *Fish growth, Leuciscus leuciscus, Ourthe River, Rivers, *Fish age.

The age and growth of L. leuciscus were studied by the scale method in 2 alkaline running waters of the drainage area of the river Meuse, the Ourthe river and the Berwine stream. The study of the nver and the Berwine stream. The study of the sees as a scale growth pattern of the age groups 0+, 1+, 2+ and 3+ showed that the annuli appear on the average in mid-May, independent of the reproduction in April. The age group 2+ was highly dominant (in biomass) in all samples: an important mortality occurs among the oldest age groups (3+ etc.). It seems to be correlated with the first sexual maturity at 3 yr.-Copyright 1972, Biological Abstracts, Inc. W73-07361

SOME ECOLOGICAL ASPECTS OF PLANT DEVELOPMENT ON COMMERCIAL DUMPS IN THE BROWN COAL BASIN AROUND MOSCOW, (IN RUSSIAN), L. V. Motorina, V. N. Cheklina, and T. I.

Soils, USSR.

The acute moisture deficit, toxicity and physical anomalies of the soil must be considered in selecting as assortment of agricultural crops to be grown on commercial dumps. Two areas of open-cut ming with different ecological conditions (altitude, water supply, temperature and rock type) were studied. Plots with sundial lupine (Lupinus polyphyllus) and a grass mixture were tested on gravelly areas; more loamy areas were planted with blue hybrid lupine (Medicago sativa) and another grass mixture. The water supply was low in both areas. Lupine fared better than the grassine to the cases. The legumes did better than the gramineous plants due to deeper root penetration. After several years, cultivation had a noticeable effect on soil formation, content of organic matter, acration and water regime.—Copyright 1972, Biological Abstracts, Inc.

DESICCATION OF CAREX PHYSODES AND CAREX PACHYSTYLIS IN RELATION TO WEATHER AND ECOLOGICAL CONDITIONS,

(IN RUSSIAN),
A. A. Kiril'tseva, and A. M. Babaev.
Ekologiya. Vol 2, No 2, p 90-92. 1971. Illus.
Identifiers: "Carex pachystylis M, "Carex physodes M, "Desiccation, Ecological conditions, Weather, Sedges.

With normal weather conditions the duration of desiccation of these sedges lasts 10-15 days. If there is only slight rainfall at the start of the desiccation period the process is extended to 20 days. If there is abundant rainfall the duration of the period of drying up of the sedges is increased to 30 days.—Copyright 1972, Biological Abstracts, Inc. W73-07463

THE PRIMARY PRODUCTION OF SOME AS-SOCIATIONS OF AQUATIC MACROPHYTES OF THE CRAPINA-JIJILA LAKE COMPLEX (DUBROVNIK),

Rev Roum Biol Ser Bot. Vol 16, No 5, p 335-339.

Identifiers: "Aquatic plants, Associations, "Primary productivity, Crapina-Jijil Lake, Depth, Dubrovnik, Lakes, Macrophytes, Romania.

Plant mass quantity was found to vary as a func-tion of water depth, the substate, and the morphology of the respective basin and its rela-tionship to other nearby basins. It also varied as a function of the age of the plant associations and as a function of the vegetative period of the plant species and the degree of filing up of the basin. Determiningfactors were the time, quantity, and duration of the floods.—Copyright 1972, Biological Abstracts. Inc. Abstracts, Inc. W73-07476

DISTRIBUTION OF COTTUS POECILOPUS HECKEL AND C. GOBIO L. (PISCES) IN SCAN-

Lund Univ. (Sweden). Dept. of Animal Ecology.

Zool Scr, Vol 1, No 2, p 69-78, 1972, Illus. Identifiers: Cottus gobio, Cottus poecilopus, Distribution, *Pisces, *Scandinavia, Sympatry,

The distribution of the freshwater sculpins C. poecilopus Heckel and C. gobio L. in Scandinavia is presented. In southern Scandinavia there are rather defined limits between the species with C. poecilopus in the upper parts of the water courses and C. gobio in the lower reaches. There are few cases of sympatry. In northern Scandinavia there is a broad overlap and coexistence is common in the large rivers. The distribution pattern seems to be partly a result of an interaction between the species. In the South, the sharp limits are set by falls blocking the upstream dispersal of C. gobio

Group 21-Water in Plants

thus indicating an exclusion of C. poecilopus in the lower reaches below the falls by the presence of C. gobio there. Where the species meet or overlap there is a habitat segregation.—Copyright 1972, Biological Abstracts, Inc.

ON SOME NEW SCENEDESMUS: II, University of Agriculture, Godollo (Hungary). Inst. of Botany and Plant Physiology.

T. Hortobagyi Acta Biol Acad Sci Hung. Vol 22, No 4, p 385-391.

ldentifiers: Basins, *Budapest, *Danube River, Granulatus, Hungary, Phytocenosis, *Scenedesmus, Scenedesmus carinatus var bicau-datus, Scenedesmus intermedius F, Scenedesmus intermedius F danubiaiis, Scenedesmus inter-medius F elegans, Sedimentation.

From the ground-water-enriching and sedimenta-From the ground-water-enriching and sedimenta-tion basins fed by the Danube water, of the Water-works of Budapest, 4 new taxa, S. carinatus (Lemm.) Chod. var bicaudatus, S. intermedius Chod. f. danubialis, S. intermedius Chod. f. elegans, S. intermedius Chod. f. granulatus are described. Phytocenotic relations are also discussed.—Copyright 1972, Biological Abstracts, Inc. W73-07617

ENVIRONMENTAL CONTROL OF STOMATAL ACTIVITY IN MATURE SEMIARID SITE PON-

DEROSA PINE, Oregon State Univ., Corvallis A. P. Drew, L. D. Drew, and H. C. Fritts. Journal of the Arizona Academy of Science, Vol 7, No 2, p 85-93, June 1972. 6 fig, 43 ref.

Descriptors: *Stomata, *Plant physiology, *En-vironmental effects, *Moisture stress, *Ponderosa pine trees, *Soil-water-plant relationships, En-vironmental control, Arid lands, Arizona, Laboratory tests, Dendrochronology, Photoperiodism, Temperature, Limiting factors, Absorption, Translocation, Soil moisture, Light, Solar radiation, Climatic data, Transpiration, Photosynthesis, Vapor pressure, Osmotic pressure, Dehydration. Identifiers: Guard cells.

The laboratory of Tree Ring Research at the University of Arizona has been involved for the past decade in investigation on the physiological basis for variations in tree-ring growth and climate. Studies focus on relationships governing trees in semiarid sites, which are frequently subjected to water stress. This study describes the changes in size of stomates that were apparent and attempts to relate these changes to other measured processes and to changes in the environment. Sto-matal activity in ponderosa pine is strongly af-fected by light, temperature, and water, and it is not unusual for one factor to become comparatively more limiting to the physiological processes in-volved in guard cell action. Aperture size rapidly increases often with the first trace of light on the horizon. Marked decreases in light in midday may cause stomatal closure. Aperture width may be affected indirectly by low temperatures of the soil and tree as they may limit absorption and translocation of water. Low soil moisture and high radiation and temperature create conditions favorable for the development of internal water stress. Under such climatic stress, stomata exhibit varying degrees of closure. Observed midday decreases in transpiration and net photosynthesis are at least partially artifactual in nature. Under hot, dry conditions with high radiation, air tem-peratures within a branch bag (polyethelene) may greatly exceed ambient temperatures thus favoring greatly exceed ambient temperatures thus Iavoring excessively high leaf-air vapor pressure gradients and high water loss. Nighttime opening was observed over a range of air temperature from 7 to 0. C. This phenomenon is possibly related to lower osmotic potential and increased guard cell turgor

during winter through normal rehydration of nee-dle tissue following transpiratory loss. (Black-

ALTITUDINAL ZONATION OF CHIPMUNKS (EUTAMIAS): ADAPTATIONS TO ARIDITY AND HIGH TEMPERATURE, Stanford Univ., Calif. Dept. of Biological

No. C. Heller, and T. Poulson.
The American Midland Naturalist, Vol 87, No 2, p 296-313, 1972. 4 fig, 3 tab, 22 ref.

Descriptors: "Wildlife management, "Distribu-tion, "Adaptation, "Limiting factors, "Animal physiology, "Animal populations, Altitude, Arid lands, Temperature, Biology, Water balance, Thermal stress, "California, Humidity, Range management, Animal control, Mammal groupings,

Differential adaptations of Eutamias chipmunks to aridity and high temperatures may play a role in limiting their distributions. A comparative study of the water balance and tolerance to temperature stress was therefore undertaken. Fecal, urinary stress was therefore undertaken. Fecal, urnary and evaporative water losses were measured at 15C, 50-75 per cent relative humidity for four species which are contiguously allopatric and altitudinally zoned on the eastern slope of the Sierra Nevada, California. Evaporative loss and hyperthermia were also studied for acute exposures to 25, 35, and 40C. Differences in total water but the stress that the control of the control budgets, calculated for 35C and 11 per cent rela tive humidity are not important in determining the lines of contact, starting from the alpine and descending toward the desert, between E. alpinus descending toward the desert, between E. alpinus and E. speciosus, or between E. speciosus and E. amoenus. But they may play a role in preventing E. amoenus from colonizing the desert sagebrush habitat occupied by E. minimus. E. minimus can be active in the open areas of the hot, arid sagebrush desert by minimizing evaporative water loss and tolerating increased body heat content; this species frequently retreats to its burrows to unload excess body heat. When large patches of shade are available from pinon pines the aggressively dominant E. amoenus can occupy the sagebrush habitat. Hence, in the field area of this study the line of contact between E. amoenus and E. minimus coincides with the lower limits of the pinon pine. (Black-Arizona) pinon pine. (Black-Arizona) W73-07645

OF BLUE PANICGRASS (PANICUM TIDOTALE RETZ.), Arizona Univ., Tucson. Dept. of Agronomy. For primary bibliographic entry see Field 03F. W73-07646 ROOT ANATOMY AND GROWTH RESPONSES

EFFECT OF CALCIUM ON PERMEABILITY OF ROOTS OF PLANTS GROWN AT HIGH SODIUM CHLORIDE CONCENTRATION, Sind Univ., Hyderabad (Pakistan). Dept. of Botany. For primary bibliographic entry see Field 03C. W73-07647

A COMPENSATING METHOD FOR MEASUR-ING CARBON DIOXIDE EXCHANGE, TRANS-PIRATION, AND DIFFUSIVE RESISTANCES OF PLANTS UNDER CONTROLLED ENVIRON-MENTAL CONDITIONS, Illinois Univ., Urbana. Dept. of Botany.

For primary bibliographic entry see Field 02D. W73-07655

DESERT POLLEN PRODUCTION I: QUALITA-TIVE INFLUENCE OF MOISTURE, Arizona Univ., Tucson. Dept. of Geosciences. A. M. Soloman, and H. D. Hayes.

Journal of the Arizona Academy of Sciences, Vol 7, No 2, p 52-74. June 1972. 4 tab, 11 fig, 47 ref.

*Limiting factors, *Environmental effects, *Annual succession, Desert plants, Pollen, *Arizona, Moisture, Arid lands, Southwest U.S., Seasonal, Rainfall, Adaptation, Phenology, Dispersion, Wet seasons, Local precipitation.

The objectives were to determine the validity of pollen production-moisture associations in an arid region. Since water is a major source of variation in season-to-season pollen production in tem-perate climates, it was felt even stronger relationships would exist in arid environments. Monthly and seasonal pollen deposition, recorded during a continuous airborne pollen survey over a 17 1/2 year period, was coupled with U.S. Weather Bureau records on rainfall and with derived values for water stress to provide a basis for determining the relationships between moisture and pollen production in a Sonoran Desert urban site. Two separate and very distinct pollination seasons ('spring', December-July; 'summer', August-November) were uncovered, resulting from similarly independent rainfall seasons. Spring pollination of some native trees was related moisture during the winter rainfall period. Introduced ornamental trees related to dry conditions during the summer previous to pollination or were erratic in their spring pollination response to prior rainfall seasons. Spring and late summer herb pollen types (Gramineae, cheno-ams and Com-positae) responded strongly, and in most cases clearly, to variations in moisture. Generally, spring flowering herbs were less specific in their responses to moisture than were late-summer pol-linators. Response to rainfall by herb pollen produ-cers was discussed as a function of plant adapta-tion to arid environments. (Black-Arizona) W73-07656

SURVEY OF FLOODPLAIN VEGETATION ALONG THE LOWER GILA RIVER IN SOUTHWESTERN ARIZONA,

Arizona Univ., Tucson. Office of Arid-Lands Research. For primary bibliographic entry see Field 03B.

THE ACTION OF THE SALT CONTENT ON THE DIATOM FLORA AS FOUNDATION FOR A BIOLOGICAL ANALYSIS AND CLASSIFICA-TION OF INLAND WATERS.

Limnologica. Vol 8, No 2, p 505-525. 1971. Illus. Identifiers: Achnanthes brevipes, Amphora ovalis, Biological classification, "Diatoms, Diatoma hiemale mesodon, Eunotia, Flora, Melosira nummuloides, Pinnularia, "Salt content, Surirella linearis, Synedra affinis, Tabellaria floc-culosa, Inland waters, *Halobiotic index.

The benthic diatom flora was investigated in bodies of water in Thueringen with very different salt concentration. The halobiotic index was defined for the diatom population characteristic of different salt content. Among halophobic or halox-enic forms were Eunotia and Pinnularia as well as Tabellaria flocculosa, Diatoma hiemale var. mesodon and Surirella linearis. Amphora ovalis is typical of Ca-free water. Halobionts include Melosira nummuloides, Synedra affinis var. obutsa, Achnanthes brevipes var. intermedia and others. There were good correlations between the halobiotic index and the dissolved salts. The concentration of calcium bicarbonate is the main factor in freshwater and the osmotic pressure or molarity in salt water.--Copyright 1972, Biological

2.J. Erosion and Sedimentation

TECHNIQUE FOR EVALUATING SEDIMENTA-TION AT RIVER MOUTHS, Puerto Rico Univ., Mayaguez. Water Resources

Research Inst.

D. S. Sasscer, K. B. Pedersen, and A. E. Gileadi. . Available from the National Technical Informa-tion Service as PB-218 711, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report. January 1973. 34 p, 9 fig, 3 tab, 6 ref. OWRR-A-028-PR (1).

Descriptors: *Suspended solids, *Sediments, *Dispersion, River flow, *Neutron activation analysis, Aluminum, *Sedimentation rates, *Puerto Rico, Analytical techniques, *Mathematical studies, *Sedimentation.

The object was to develop an approximate technique for evaluating the dispersion and rate of settling of suspended sediment in a river and at the river-ocean interface. The technique of neutron activation analysis of samples was developed for the determination of the amount of alumi suspended sediment. A mathematical program, based on conservation of mass and compartmentalization of the river in two dimensions, was prepared. This program determines the time dependent mass transfer coefficients among compartments or predicts the suspended sediment movement among compartments. The program was not verified with actual data but was tested with trial data to give known solutions. The method can be used, under certain conditions, to show either the rate of settling outside the river mouth or the amount of turbulence inside the river boundaries. This method does not attempt to account for the bed-load which is very difficult to measure by any method. W73-07161

A HYDROGEOLOGIC INVESTIGATION OF THE LEE FARM AREA, SOUTH COVENTRY, CONNECTICUT, Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 04B. W73-07167

SEDAN-A COMPUTER PROGRAM FOR SEDI-MENT PARTICLE-SIZE ANALYSIS.

Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
J. P. Coakley, and G. S. Beal.

Report Series No 20, 1972. 33 p, 4 fig, 2 tab, 12 ref, 2 append.

Descriptors: *Sedimentation, *Sediments, *Particle size, *Computer programs, Methodology, Histograms, Sediment sorting, Sands, Silts, Clays, Analytical techniques. Identifiers: FORTRAN IV.

SEDAN is a computer program written in FOR-TRAN IV to calculate the mean and the first three moments about the mean (variance, skewness measure and kurtosis measure) for a sediment particle-size distribution using the method of moments (Krumbein, 1936). A line-printer probability plot of the cumulative percent versus size class and of the frequency histogram is included in the output from the program. In addition, the standard deviation, mode, percentages of sand, silt and clay, and the amount of sample finer than 9 phi (2 microns) are calculated and the sediment type is labeled using the Shepard (1954) textural nomen-clature. (Woodard-USGS)

SEDIMENTATION IN THE INNER ESTUARY OF THE THAMES, AND ITS RELATION TO THE REGIONAL SUBSIDENCE, King's Coll., London (England). Dept. of Geology. For primary bibliographic entry see Field 02L. W73-07235

SUBSIDENCE AND SEA-LEVEL RISE IN THE THAMES ESTUARY, Polytechnic, London (England). Thames Estuary

Polytechnic, London Carlos Research Group. Research Group. For primary bibliographic entry see Field 02L. W73-07236

SEA-LEVEL OBSERVATIONS AND THEIR

SECULAR VARIATIONS AND THEIR SECULAR VARIATION, Institute of Coastal Oceangraphy and Tides, Bir-kenhead (England). For primary bibliographic entry see Field 02L. W73-07237

THE TIDAL REGIME OF THE RIVER THAMES: LONG-TERM TRENDS AND THEIR POSSIBLE CAUSES,

Institute of Coastal Oceanography and Tides, Bir-kenhead (England).

For primary bibliographic entry see Field 02L. For primary W73-07238

FLOW DYNAMICS, REGIME, THEORY, AND METHODS OF COMPUTATION AND MEASUREMENT OF SEDIMENTS AND WASTE WATER (DINAMIKA POTOKOV, REZHIM, TEORIYA, METODY RASCHETA I 12-MERENIYA NANOSOV I STOCHNYKH VOD). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (ISSE) grad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, Leningrad, A. V. Karaushev, and I. V. Bogolyubova, editors, 1969. 214 p.

Descriptors: "Flow, "Sediments, "Sedimentation, "Sediment discharge, "Sediment load, Bed load, Sediment load, Sediment load, Sediment load, Sediment load, Sediment load, Pediment load, Pediment load, Pediment load, Pediment load, Pediment load, Waste water (Pollution, Waves (Water), Winds, Rivers, Ponds, Matherical water)

inductar studies. *USSR, *Fluid dynamics, *Stream competence, Wind-driven currents, Bathometers, Nomograms.

Various aspects of flow dynamics and sedimenta-tion are investigated in this collection of 13 papers tion are investigated in this collection of 13 papers authored by workers at the State Hydrologic Institute in Leningrad. The subjects of the individual papers are: (1) wind-wave development and sediment saturation of water masses; (2) similitude criteria for modeling wind-driven currents and pollutants in inland bodies of water; (3) method of apparatus of transactic similarion and wariarusants in initiand bodies of water; (3) method of approximation of transverse circulation and variability of depths in computations of waste-water dilution in rivers; (4) problems in the theory of laminar flows and sediment- and wastewater-carying turbulent channel flows; (5) calculation of the competence of an ice-covered stransw. (6) of rying turbulent channel flows; (5) calculation of the competence of an ice-covered stream; (6) effect of coarse-sediment grain shape and orientation on flow resistance; (7) pulsation of bedload movement in mountain streams, as illustrated by the Mzymta River; (8) statistical analysis of grainsize distribution of bottom sediments; (9) application of flow-competence formulas to calculation of annual suspended-sediment discharge; (10) classification of relationships between suspended-sediment discharges; (11) instantional discharges and water discharges; (12) instantional discharges and water discharges; (13) instantional discharges and discharges and discharges are discharges and discharges and discharges are discharged discharges are discharged discharged discharged discharges are discharged di sufication of relationships between suspended-sediment discharges and water discharges; (11) in-vestigation of the frequency and duration of periods with high and low annual suspended-sedi-ment discharges; (12) distribution of average tur-bidity in rivers of Kamchatka and its relation to natural factors; and (13) calculation of pond silt-ing. (See also W73-07258 thru W73-07267) (Josef-son-USGS) W73-07257

WIND-WAVE DEVELOPMENT AND SEDI-MENT SATURATION OF WATER MASS (RAZVITIYE VETROVOGO VOLENIYA NASYSHCHENIYE VODNYKH M. NASYSHCHENIYE NANOSAMI), arstvennyi Gidrologicheskii Institut, Lenin

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

A. V. Karaushev.

In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 3-36, Leningrad, 1969. 4 fig. 4 tab, 14

Descriptors: "Waves (Water), "Winds, "Sediments, "Energy, Energy budget, Energy dissipation, Energy loss, Energy transfer, Energy equation, Turbulence, Turbidity, Shear stress, Bodies of water, Fetch, Fluctuations, Variability, Probability bility. Identifiers: *USSR.

The general equation of wave energy is applied to a system of waves of various size for solution of problems on wind waves in comparatively shallow bodies of water, such as reservoirs, lakes, and shallow seas. Particular attention is given to clari-fying the nature of the acting forces and to establishing approximate analytical relations for the tangential stress arising at the free-water sur-face under the effect of wind and for the resisting force producing a wave-energy loss. Equations are derived for cases of stabilized waves, growth and decline of waves along a fetch, development and extinction of waves in time, and for variations in turbidity caused by wind waves. (See also W73-07257) (Josefson-USGS)

PROBLEMS IN THE THEORY OF LAMINAR AND SEDIMENT- AND WASTEWATER-CARR-YING TURBULENT CHANNEL FLOWS (VOPROSY TEORII DVIZHENIYA RUS-LOVYKH POTOKOV --TURBULENTNYKH, PEREMESHCHAYUSHCHIKH PRIMESI, I LAMINARNYKH), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). V. M. Makkaveyev.

N. manadayev-V. In: Manadayev-V. In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 65-90, Leningrad, 1969. 12 ref.

Descriptors: *Kinetics, *Flow, *Channel flow, *Turbulent flow, *Laminar flow, Energy, Energy dissipation, Energy loss, Sediments, Waste water (Pollution), Equations. Identifiers: *USSR, Fluid dynamics, Torque.

Methods are proposed for explaining the probable character of formation of turbulent pulsation in channel flows and the resultant energy dissipation. Emphasis is placed on the need to reconsid Emphasis is placed on the need to reconsider and supplement the concepts of classical hydromechanics as applied to dynamics of real fluids. This involves: (1) introduction of the concept of torque reduced to unit volume and area; (2) justification of the assumption of nonzero flow velocities at the flow-braking boundary; and (3) consideration of the pulsation peculiar to laminar flows. (See also W73-07257) (Josefson-USGS) W73-07259

CALCULATION OF THE COMPETENCE OF AN ICE-COVERED STREAM (RASCHET TRANSPORTIRUYUSHCHEY SPOSOBNOSTI POTOKA, POKRYTOGO L'DOM), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

Gosudarstvenny Gidrologicneskii institut, Leningrad (USSR).
K. V. Razumikhina.
In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 91-107, Leningrad, 1969. 2 fig., 3 tab, 8 cf. 2 anest. 8 ref, 2 append.

Group 2J-Erosion and Sedimentation

Descriptors: *Sedimentation, *Sediments, *Parti-cle size, *Streams, *Ice cover, Discharge (Water), Turbidity, Velocity, Chezy equation, Mannings equation, Roughness (Hydraulic), Roughness equation, Roughness (Hydraulic), Roccoefficient.
Identifiers: *USSR, *Stream competence.

A formula derived for competence of an ice-covered stream is based on theoretical considera-tions of the vertical distribution of velocity and turbidity. Application of the formula to rivers in the Ural and Kama River basins revealed, in most cases, a satisfactory agreement between the com-puted and observed values. (See also W73-07257) (Josefson-USGS) W73-07260

EFFECT OF COARSE-SEDIMENT GRAIN SHAPE AND ORIENTOATION ON FLOW RE-SISTANCE (VLIYANIYE FORMY KRUPNYKH CHASTITS NANOSOV I IKH ORIYENTATSII V

CHASTITS NANOSOV I IKH ORIYENTATSII V
POTOKE NA GIDRODINAMICHESKOYE
SOPROTIVLENIYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V.V. Romanovskiy.
In: Dinamika potokov, rezhim, teoriya, metody
rascheta i izmereniya nanosov i stochnykh vod;
Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 108-118, Leningrad, 1969. 3 fig, 2
tab, 4 ref.

Descriptors: *Coarse sediments, *Particle shape, *Particle size, *Flow resistance, Flow rates, Drag, Shear drag, Viscosity, Fluid friction, Roughness (Hydraulic), Turbulent flow, Reynolds number, Stokes law, Flumes, Equations.

Identifiers: *USSR.

Experimental investigations were carried out at the sediment laboratory of the State Hydrologic Institute to study flow resistance as a function of grain shape and orientation in a stream. Over 600 tests were made of flow resistance coefficients for particles ranging in diameter from 15 to 50 mm at flow velocities of 0.15 to 1.6 m/sec. Graphs are presented of the relationship between flow resistance coefficients and the coefficients of grain shape and orientation. (See also W73-07257) (Josefson-USGS) W73-07261

PULSATION OF BEDLOAD MOVEMENT IN MOUNTAIN STREAMS, AS ILLUSTRATED BY THE MZYMTA RIVER (O PUL'SATSII PEREMESHCHENIYA VLEKOMYKH NANOSOV V GORNYKH REKAKH (NA PRIMERE R. MZYMTY)), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). N. Ya. Solov'yev.

N. Ya. Solov'yev.
In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 119-123, Leningrad, 1969. 1 fig, 2 ref.

Descriptors: *Bed load, *Coarse sediments, *Sediment transport, *Movement, *Streams, Rivers, Discharge (Water), Sediment discharge. Identifiers: *USSR, *Mzymta River, *Bedload transport, Bathometers, Oscillograms.

Investigations of bedload movement in the Mzym ta River in the Caucasus were based on field ob-servation data obtained in 1966 and 1968 by a coarse-sediment transport recorder. Oscillogra of coarse-sediment movement in streamflow are presented together with graphs showing the pu presented together with graphs showing the pulsa-tion of sediment movement intensity in time. The period of bedload transport pulsation decreases with increasing water discharge in the river. To im-prove accuracy of bedload discharge determina-tions, the previously established pulsation period should be assumed as the delay time of the bathometer. (See also W73-07257) (Josefson-15GCS). W73-07262

APPLICATION OF FLOW-COMPETENCE FORMULAS TO CALCULATION OF ANNUAL
SUSPENDED-SEDIMENT DISCHARGE
(PRIMENENIYE FORMULY TRANSPORTIRUYUSHCHEY SPOSOBNOSTI POTOKA
DLYA RASCHETA GODOVOGO STOKA VZVESHENNYKE NANOSOV),
GOSUGARSTVENNY GİGTOLOĞİCHESKİİ İnstitut, Leninerad (IJSS)

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. V. Razumikhina.
In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 137-154, Leningrad, 1969. 5 fig, 2 tab, 18 ref, 1 append.

Descriptors: "Equations, "Sediments, "Sediment discharge, "Suspended load, Suspension, Turbidity, Particle size, Sediment transport, Discharge (Water), Measurement, Annual.

Identifiers: "USSR, "Stream competence, Nomo-

Available methods for calculating the competence of a stream are reviewed. Improvements are in-troduced to techniques of sediment-transport anal-ysis, and recommendations are made for determinysis, and recommendations are made to decriming annual suspended-sediment discharge in poorly gaged streams and for performing calcula-tions based on measurements for 1-2 months a year. The methods recommended give annual sediment discharge to within 20% of the values obtained by methods based on continuous measurements for 3-5 years. (See also W73-07257) (Josef-W73-07263

CLASSIFICATION OF RELATIONSHIPS BETWEEN SUSPENDED-SEDIMENT DISCHARGES AND WATER DISCHARGES (TIPIZATSIYA ZAVISIMOSTEY RASKHOOV VZVESHENNYKH NANOSOV OT RASK-HODOV VODY), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). Ye. S. Semenova.

Ye. S. Semenova. In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Tru-dy, No 175, p 155-169, Leningrad, 1969. 4 fig, 3 tab, 9 ref.

Descriptors: *Sediment discharge, *Suspended load, *Suspension, *Discharge (Water), Turbidity, Floods, Flood plains, Channels, Rivers, Gaging stations, Water sampling, Annual. Identifiers: *USSR, *Kama River.

Investigation of long-term relations between suspended-sediment discharges and water discharges was based on observation data obtained at 11 gaging stations on 7 rivers in the Kama River Basin in 1939-65. Methods are proposed for quantitative analysis of the reliability of daily observations of turbidity and sediment discharge and for determination of maximum annual suspended-sediment discharges. (See also W73-07257) (Josefson-IJSGS) son-USGS) W73-07264

INVESTIGATION OF THE FREQUENCY AND DURATION OF PERIODS WITH HIGH AND LOW ANNUAL SUSPENDED-SEDIMENT DISCHARGES (ISSLEDOVANIYE POVTO-RYAYEMOSTI I PRODOLZHITEL'NOSTI PERIODOV S POVYSHENNYM I PONIZHEN-NYM GODOVYM STOKOM VZVESHENNYKH

NAMOSOV, Gosudarstvennyi Gidrologicheskii Institut, Lenin-grad (USSR). N. N. Bobrovitskaya. In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod;

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 170-188, Leningrad, 1969. 2 fig, 5 tab, 9 ref.

Descriptors: *Sediment discharge, *Suspended load, *Annual, *Mathematical studies, *Statistical methods, Monte Carlo method, Correlation analysis, Probability, Stochastic processes, Statistical models, Equations, Rivers.
Identifiers: *USSR.

The frequency and duration of periods with high and low annual discharges of suspended sediments were investigated in 7 rivers of the Caucasus and were investigated in 7 rivers of the Caucasus and Lower Volga region. An artificial record of 2,000 years was generated using the Monte Carlo method. An estimate was made of the effect of the correlation between discharges of successive years on the distribution of groups of years of different duration. Graphs were constructed to show the probability and frequency of groups of years with annual suspended-sediment discharges of different probability. Also examined is the problem of determining total sediment discharge of different probability over a period of n years. (See also W73-07257) (Josefson-USGS)

DISTRIBUTION OF AVERAGE TURBIDITY IN RIVERS OF KAMCHATKA AND ITS RELA-TION TO NATURAL FACTORS (RAS-PREDELENIYE SREDNEY MUTNOSTI REK PO TERRITORII POLUOSTROVA KAMCHATKA I SVYAZ' YEYE S PRIRODNYMI FAKTORAMI), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. I. Stepanova.
In: Dinamika potokov, rezhim, teoriya, metody rascheta i Izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 175, p 189-198, Leningrad, 1969. 2 fig, 1 tab, 8 ref.

Descriptors: *Turbidity, *Sediment discharge, *Discharge (Water), *Rivers, *Geomorphology, Gradients (Streams), Drainage area, Volcanoes, Mudflows, Mapping, Maps. Identifiers: *USSR, *Kamchatka.

Average long-term turbidity in rivers of the Kamchatka Peninsula varies between 6 and 400 g/cu m, and increases from northwest to southeast. Turbidity is lowest (less than 50 g/cu m) in rivers flowing from the western slopes of the Central Range (Sredinnyy khrebet) into the Sea of Okhotsk and the Shelekhova Gulf; moderate (50-100 g/cu m) in left-bank tributaries of the Kamchatka River north of the mouth of the Andriyanovka River; and highest (100-400 g/cu m) in the volcanic area which includes rivers along the right bank of the Kamchatka River and left-bank tributaries of the Avacha River. Relations of average turbidity to drainage area and weighted mean river gradient are examined and, based on the relation between average annual water discharges and turbidity, a formula is derived for calculating average turbidity of ungaged rivers. (See also W73-07257) (Josefson-USGS)

CALCULATION OF POND SILTING (RASCHET ZAILENIYA PRUDOV), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). K. N. Lisitsyna.

R. N. Listisyna.
In: Dinamika potokov, rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod;
Gosudarstvennyv Gidrologicheskiy Institut Trudy, No 175, p 199-208, Leningrad, 1969. 4 fig, 2 tab, 9 ref.

Descriptors: *Sedimentation, *Silting, *Deposi-tion (Sediments), *Sediment discharge, *Ponds, Drainage area, Discharge (Water), Equations. Identifiers: *USSR.

Erosion and Sedimentation—Group 2J

To calculate silting of bodies of water, an equation was developed to express the sediment-holding capacity of a water body as a function of its relative capacity and drainage area. The relative capacity is the ratio of the volume of a water body is the annual water inflow. The relative sediment-holding capacity of a water body is the ratio of annual sediment accumulation to annual sediment discharge. It may also be expressed as the ratio of silting at different relative capacity values to the maximum silting value at unit relative capacity. The relations derived can be used to calculate silting of ponds with drainage areas of 5-8 sq km and 30-40 sq km in moisture-deficient regions of northern and western Kazakhstan, Kursk Oblast, the Southern Urals, and steppes of the northern Caucasus. (See also W73-07257) (Josefson-USGS) W73-07267

DISTRIBUTIONAL TRENDS IN THE RECENT MARINE SEDIMENTS OF TUSIUJAQ COVE OF EKALUGAD FIORD, BAFFIN ISLAND, N. W.

T., McMaster Univ., Hamilton (Ontario). Dept. of Geology. For primary bibliographic entry see Field 02L W73-07268

THE MORPHOLOGY OF NORTHEAST GULF OF ST. LAWRENCE, Canadian Hydrographic Service, Ottawa (On-

For primary bibliographic entry see Field 02L W73-07269

PROBABLE HOLOCENE TRANSGRESSIVE EF-FECTS ON THE GEOMORPHIC FEATURES OF THE CONTINENTAL SHELF OFF NEW JER-SEY, UNITED STATES, Rhode Island Univ., Kingston. Graduate School of

Oceanography.
C. E. McClennen, and R. L. McMaster.
Maritime Sediments, Vol 7, No 2, p 69-72, September 1971. 2 fig. 1 tab, 17 ref. ONR Contract No N00014-68-A-2015-003.

Descriptors: "Sea level, "Topography, "Continental shelf, "New Jersey, "Geomorphology, Quaternary period, Sand bars, Dunes, Beaches, Coasts, Shores.

Continental shelves have been greatly influenced by Quaternary events, particularly those of the Pleistocene Epoch. Recently a series of large-scale Presistocene Epoch. Recently a series of large-scale bathymetric charts at a one-fathom contour interval was published for the New Jersey shelf from which additional detail can be observed regarding this shelf's relief. The shelf surface has more than 1000 minor linear ridges and depressions, the majority of which parallel the northeast-southwest trend of the shoreline and shelf edge and occur generally in pairs with the ridge seaward of the depression. However, the linearity becomes less depression. However, the linearity becomes less distinct and the pattern of paired topographic highs and lows is less typical in water shallower than 20 fms. These features range from 1 to more than 20 miles in length, 0.5 to 10 miles in width, and I to I of ms above or below the general bottom surface. Mean values show lengths of 4 to 5 miles, widths of about I mile, and relief of 1 to 2 fms. The largest ridges and depressions occur in the northeastern part of the area. For approximately 85% of the features, the ridges are attached toward the southwest and the depressions have their lowest sills toward the northeast. Most paired lights ridges and descriptions ridges and descriptions between 10 and 100. linear ridges and depressions between 10 and 100 fms lie on distinct erosional-depositional surfaces. Those surfaces at 13, 20, 25, 30, 35, 38, 43, and 59 fms are suggested as products of the Holocene transgression on the basis of reasonable correlation with prominent, dated, shoreline forms on the Texas shelf. (Knapp-USGS)

POSTGLACIAL SUBMERGENCE AND SALT MARSH EVOLUTION IN NEW HAMPSHIRE, New Hampshire Univ., Durham. H. W. Keene.

Maritime Sediments, Vol 7, No 2, p 64-68, September 1971. 4 fig. 1 tab. 7 ref.

Descriptors: *Salt marshes, *New Hampshire, *Sedimentation, *Quaternary period, Stratigraphy, Carbon radioisotopes, Radioactive dating, Identifiers: Hampton (N.H.), Seabrook (N. H.).

Postglacial submergence rate was linked to marsh evolution by radiocarbon dating of peat in New Hampshire marshes. A seaward thickening edge of postglacial sands, silts and salt marsh peat overlies the glacial and bedrock marsh basement. A thin discontinuous peat layer forms the base of the postglacial sequence and contains the remains of logs, twigs and leaves, with lesser salt-marsh and fresh-water marsh vecetation. The next is a logs, twigs and leaves, with lesser suit-mars and fresh-water marsh vegetation. The peat is a diachronous unit. This peat formed in an environ-ment analagous to that of the present day inland marsh boundary where the forest lies adjacent to the salt marsh at approximately the level of mean high water. The average rate of subpresence the salt marsh at approximately the level of mean high water. The average rate of submergence between 6850 B.P. and 4000 B.P. was 0.0023 m per year. The rate of submergence began to decrease significantly sometime around 4000 B.P., and the average rate since 4000 B.P. has been 0.0011 m per year. The submergence rate curve supports the stratigraphic evidence that submergence has been continuous during the formation of the Hampton-Seabrook marshes. (Knapp-USGS)

COASTAL GEOMORPHOLOGY.

Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972: Binghamton, State University of New York Publications in Geomorphology, 1973, D. R. Coates, editor. 404 p.

Descriptors: *Coasts, *Geomorphology, Beach erosion, Water circulation, Sedimentation, Beaches, Sand bars, Sand spits, Sediment transport, Surveys, Mud flats, Littoral drift, Currents (Water), Waves (Water), Surf, Data collections, Barrier islands. Identifiers: *Coastal geomorphology.

This volume presents the collection of papers given at the Third Annual Geomorphology Symposium in the Department of Geology, State University of New York at Binghamton, September 28-30, 1972. The necessity for interdisciplinary cooperation to understand the processes and the terrain of the littoral zone is reflected in the contributions. The central theme is the dynamic aspect of the coastal environment and the way geomorphic principles can be used to solve problems. Part 1, Coastal Processes, deals with the dynamics of the littoral zone and the resulting problems. Part 1, Coastal Processes, deals with the dynamics of the listoral zone and the resulting landforms. Emphasis is placed on erosional and accretional phases of shoreline development. Part 2, Barrier Islands, ranges from historical accounts to investigation of areas previously unexamined. Man's alteration of the natural system provides valuable data for increasing geomorphic knowledge. Part 3, Applications of Geomorphology, shows the relation of geomorphology to man and engineering, as well as the practical aspect of geomorphic input toward providing greater understanding of other academic disciplines, including archaeology and sedimentary geology. (See also W73-07316 thru W73-07332) (Knapp-ÜSGS) W73-07316 thru W73-07332) (Knapp-ÜSGS) W73-07315

THE INVESTIGATION OF FORM AND PROCESSES IN THE COASTAL ZONE, South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst. M. O. Hayes, E. H. Owens, D. K. Hubbard, and R.

In: Coastal Geomorphology, Proc of 3rd Annu Geomorphology Symposia Series, Binghamton Y, Sept 28-30, 1972, p 11-41, 1973. 27 fig, 17 ref.

Descriptors: *Coasts, *Geomorphology, Beach erosion, Water circulation, Sedimentation, Beaches, Sand bars, Sand spits, Sediment transport, Surveys, Mud flats, Littoral drift, Currents (Water), Waves (Water), Surf, Data collections, Barrier islands.

Identifiers: *Coastal geomorphology.

Studies of the coastal zone can be classified into three categories, dependent upon the scale and detail of the study: (1) reconnaissance of a large section of coast, (2) studies at the intermediate detail of the study: (1) reconnaissance or a sarge section of coast, (2) studies at the intermediate level which involve some systematic process measurements, and (3) detailed time-series studies of a small area. Generalizations pertaining to sedimentation and morphology of mesotidal barrier islands are presented. The cycle of beach response to the passage of coastal storms in mesotidal areas consists of: (a) eroded, flat post-storm profile, (b) early-recovery profile of landward-migrating ridge-and-runnel systems, and (c) late-recovery profile of wide, welded berm. The migration of tidal inlets is an important process in the formation of barrier island deposits. Historical surveys of Sandy Neck, Mass., provide evidence of this process. Ebb- and flood-tidal deltas in mesotidal areas are remarkably similar in morphological development. Important in shaping their morphology is the time-velocity asymmetry of tidal currents. Mesotidal barrier islands also have a characteristic shape and morphology, which is tidal currents. Mesotidal barrier islands also have a characteristic shape and morphology, which is dominated by a large bulbous form at the updrift end of the island. This results, in part, from sediment accretion caused by wave refraction around the ebb-tidal delta. (See also W73-07315) (Knapp-W73-07316

THE LITTORAL POWER GRADIENT AND SHORELINE CHANGES.

SHORKLING CHANGES, Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology. J. P. May, and W. F. Tanner. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 43-60, 1973. 4 fig, 1 tab, 23

Descriptors: "Computer programs, "Beach erosion, "Coasts, "Geomorphology, Numerical analysis, Mathematical models, Beaches, Sediment transport, Waves (Water), Surf., Littoral drift. Identifiers: "Coastal geomorphology.

A computer program was written so that deep-water wave parameters (height, length, approach direction) can be modified across a shoaling bottom having known bathymetry, to produce an expression for the longshore component of wave power per unit length of shoreline. The data required are wave energy density, wave phase velocity, and the angle formed by the intersection of the wave crest and the isobath. Determination of wave power at a series of points along a shoreline permits the computation of a longshore power gradient. A positive power gradient in the direction of longshore drift indicates shoreline erodirection of longshore drift indicates shoreline erosion. A negative gradient indicates deposition. The
computer program involves a numerical approximation to the prototype bathymetry and produces
very small errors. A single small error may lead to
cumulated effects at the surf zone: thus not all
data points along the beach are equally reliable.
Comparison with the theoretical model, however,
coupled with more detailed analysis in questionable areas, can lead to the elimination of trouble
spots. Within these limits, the theoretical model is
confirmed. (See also W73-07315) (Knapp-USGS)
W73-07317

Group 2J-Erosion and Sedimentation

PROBABLE CAUSES OF SHORELINE RECES-PROBABLE CAUSES OF SHORELINE RECES-SION AND ADVANCE ON THE SOUTH SHORE OF EASTERN LONG ISLAND, Long Island Univ., Southampton, N.Y. Southamp-ton Coll. C. L. McCormick.

In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 61-71, 1973. 4 fig, 1 tab, 2

Descriptors: *Beaches, *Beach erosion, *New York, *Coasts, *Geomorphology, Waves (Water), Surf, Inlets (Waterways), Sedimentation, Sediment transport, Littoral drift, Coastal engineering, Barrier islands. *Coastal geomorphology, *Long

Identifiers: Island (N Y).

The shoreline along the south shore of eastern Long Island changes regularly in character from east to west. A profile of the shore zone drawn at any particular point can be used to infer the recent history of that particular segment of shoreline. The coastal profile west of the till cliffs at Montauk incoastal profile west of the thir chiris at Montauk indicate a slowly prograding shoreline from Napeague Harbor to East Hampton Village. West of East Hampton the profiles indicate a receding beach with a few segments temporarily stable. Further west the form of the shore zone indicates a rapidly receding barrier island. Close correlation a rapidly receding barrier island. Close correlation of increasing recession rate with the time that Shinnecock and Moriches Inlets were established suggests a causal relationship. Calculations of amount of sand trapped by Shinnecock and the amount removed by increased recession of the shoreline further suggests that the inlets are responsible for accelerated recession on the inter-vening beaches. The recession rate of the cliffs at Montauk govern to a large extent the rate of shoreline advance or retreat for beaches west to Shinnecock Inlet. The rate of recession between Shinnecock and Moriches Inlets is explained as the net effect of natural island migration and the result of reduced sand supply. Increase in sea level is not a significant factor in recession of beaches along the south shore of eastern Long Island. (See also W73-07315) (Knapp-USGS) W73-07318

DYNAMICS OF BEACH ACCRETION IN SOUTH LINCOLNSHIRE, ENGLAND, Nottingham Univ. (England). Dept. of Geography.

Nottingham Univ. (England). Dept. of Geography. C. A. M. King. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, NY, Sept 28-30, 1972, p 73-98, 1973. 9 fig, 1 tab, 2

Descriptors: "Coasts, "Geomorphology, "Sedimentation, "Tidal effects, "Littoral drift, "Deposition (Sediments), Tides, Waves (Water), Surf, Tidal streams, Tidal waters, Tidal marshes. Identifiers: "Coastal geomorphology, "Lincolnshire (England)

Beach accretion is taking place rapidly in the area between Skegness and Gibraltar Point in south Lincolnshire, England. The processes involved are generating dune ridges, saltings, new salt marsh in the shelter of a spit, foredunes with intervening marsh strips, and ridges and runnels on the wide foreshore. These features are related to the pattern of offshore tidal channels and banks. The source of material lies to the north, and it is brought into the area by tidal streams and wave drifting from a deposit of mixed glacial and fluvioglacial deposits. Sediment moves with the south-flowing flood stream onto the lower foreshore in the zones of stream onto the lower foreshore in the zones of maximum accretion. Trend analysis reveals the maximum accretion. Irena analysis reveals the marked regularity and magnitude of the accretion in terms of beach ridge size and movement, accre-tion of sediment on the foreshore, and in trends of spit growth. The sediment builds up convex-seaward elongated foredunes on a foundation of stabilized beach ridges on the upper foreshore,

while salt marsh accumulates in the sheltered runnels to landward. Ridges develop where there is a surfeit of sand on the beach, producing a gradient lower than the equilibrium wash slope gradient. In this process waves build the coast out seawards on a broad front, by the creation of 'nesses' of accumulation, the position of which is related to the pattern of offshore banks and channels. (See also W73-07315) (Knapp-USGS)

SAND BARS ALONG LOW ENERGY BEACHES, PART 1, MULTIPLE PARALLEL SAND BARS OF SOUTHEASTERN CAPE COD BAY, Massachusetts Univ., Amherst. Coastal Research

H D Nilsson

In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 99-102, 1973. 2 fig.

Descriptors: *Sand bars, *Beaches, *Coasts, Currents (Water), *Waves (Water), Geomorphology, Shoals, *Massachusetts, Surf, Littoral drift. Identifiers: *Coastal geomorphology, *Cap Cod

iple parallel sand bars are found in south em Cape Cod Bay and on other low-energy coast-lines. The conditions under which they form are: lines. The conditions under which they form are: sand-sized sediment supply, low slope gradients, repeatedly breaking and reconstructing waves, high tidal range, and low wave energy. The multiple parallel sand bars of southeastern Cape Cod Bay, in the vicinity of Brewster and Eastham have crest to crest distances which are highly variable but are on the order of 60 m. Maximum bar height is about 1 m. The bars develop in the intertidal and subtidal zones, extending to depths ranging from 2-3 m (at mean low water). No bars form above mean high water. (See also W73-07315) (Knapp-USGS) HSGS) W73-07320

SAND BARS ALONG LOW ENERGY BEACHES, PART 2, TRANSVERSE BARS, Massachusetts Univ., Amherst. Coastal Research

Center.
A. W. Niedoroda.
In: Coastal Geomorphology, Proc of 3rd Annual
Geomorphology Symposia Series, Binghamton, N
Y, Sept 28-30, 1972, p 103-113, 1973. 6 fig, 20 ref.

Descriptors: *Sand bars, *Beaches, *Coasts, *Currents (Water), *Waves (Water), Geomorphology, Shoals, Florida, Surf, Littoral

Identifiers: *Coastal geomorphology.

The areas just seaward of low energy beaches often exhibit a series of subtle digital sand bars which point either perpendicular or at a high angle to the shoreline. These sand bars are called transverse bars. In most areas the bars cause a distinct nearshore current to develop from refracted and oversteepened waves. This current system is comoversteepened waves. This current system is competent to transport wave agitated sand so the transverse bars are in a state of dynamic equilibrium with the waves and currents. The pattern of the currents which develop about transverse bars is strongly controlled by their length. Relatively short transverse bars cause a relatively strong shoreward current to develop over the axes of the length of the control snoreward current to develop over the axes of the bars. Longer sand bars cause a more complex pat-tern of current. The long bars maintain an onshore current over their seaward portions and an offshore current over their landward portions. (See also W73-07315) (Knapp-USGS) W73-07321

DEPOSITIONAL STRUCTURES AND PROCESSES IN THE MOUTHS OF SMALL COASTAL STREAMS, SOUTHWESTERN Geological Survey, Menlo Park, Calif.

H. E. Clifton, R. L. Phillips, and R. E. Hunter. In: Coastal Geomorphology, Proc of 3rd Anau Geomorphology Symposia Series, Binghamton, Y, Sept 28-30, 1972, p 115-140, 1973. 23 fig, 4 ref.

Descriptors: "Sedimentary structures, "Coasts, "Geomorphology, Dunes, Sand bars, Sand spits, Braiding, Ripple marks, Sedimentation, Deltas, Waves (Water), Surf, Tidal effects, Discharge (Water), "Oregon, Sediment transport, Littoral Identifiers: *Coastal geomorphology.

Idenifiers: *Coastal geomorphology.

The mouths of coastal streams form a depositional environment in which sedimentation is controlled by a combination of waves, tides, and river discharge. The coast of southern Oregon provides data on stream-mouth sedimentation on a coast characterized by high wave energy and moderate tidal range. The smallest streams modify the beach topography but slightly. Such streams flow in small intricately braided channels; the internal structure of the streambed material consists mostly of highly lenticular bedding, commonly defined by concentrations of heavy minerals. Larger streams are more deeply incised into the beach. On the beds of such streams, sand ripples predominate, except in main channels that are occupied by standing waves and antidunes. Fluctuation between planar and antidune bedforms generates a pulsing flow in the lower reaches. During rising tide or periods of high waves, swash processes will either bury or destroy the stream deposit. If preserved, the deposit will consist of thin sheets of ripple or other lenticular bedding interlayered with parallel swash lamination. Streams with larger discharge are deeply incised into the beach and have a bedform predominantly of megaripples. These structures may reverse their direction with incoming tide. Within the actual mouth of the stream, where wave action predominates, the bedform is generally planar. Seasonal variation in discharge may cause difpredominates, the bedform is generally planar. Seasonal variation in discharge may cause dif-ferent parts of some streams to evolve through several of the stages. (See also W73-07315) (Knapp-USGS)

BEACH PROCESSES IN AN ARCTIC EN-VIRONMENT,
McMaster Univ., Hamilton (Ontario), Dept. of

Geography. S. B. McCann

S. D. McCann. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 141-155, 1973. 6 fig, 2 tab, 7

Descriptors: "Beach erosion, "Sediment transport, "Geomorphology, "Coasts, "Arctic, "Canada, Waves (Water), Sea ice, Ice cover, Ice breakup, Storms, Beaches, Coastal engineering, Tides. Identifiers: *Devon Island (Canada), *Coastal

geomorphology.

Ice conditions, ablation sequences, beach profiles, beach sediments, wave conditions, and freeze-up sequences were studied during four field seasons, sequences were studied during four field seasons, 1968-71, in the Radstock Bay area of S.W. Devon Island in the Canadian Arctic Archipelago. The field data were supplemented by wind data from the Resolute meteorological station and ice reconsistance data for the Barrow Strait-Lancaster Sound sea area for a 10-year period, 1959-68. The special characteristics of Arctic beaches and an-Sound sea area to a toy a representation of a real special characteristics of Arctic beaches and annual beach regime in the study area are discussed. Freeze-up conditions in the fall are an important determinant of beach conditions and the operation of beach processes during the following summer. The magnitude and frequency of periods of significant wave action are considered in relation to the probability of simultaneous occurrence of ice-free occan, suitable winds, and ice-free beaches. The effects of three major storms during the study period are evaluated. The most important waves to one rate on the study beach are generated by strong perate on the study beach are generated by strong

Erosion and Sedimentation—Group 2J

winds from the southeast quadrant. Open water conditions in Lancaster Sound provide a max-imum fetch of 100 mi but for waves to be effective imum fetch of 100 mi but for waves to be effective the bay must not only be clear of solid ice cover but also free of pack ice. The combination of adverse sea, inshore and beach ice conditions means that many periods of storm force winds in the potential open water season, which has an average length of 56 d, either do not generate large waves or produce waves the energy of which is expended on ice. The dominant longshore movement of material northwards along the beach takes place very largely during occasional storms. (See also W73-07315) (Knapp-USGS)

BATHYMETRIC PROJECTED PROFILES AND THE ORIGIN OF BARRIER ISLANDS—JO-HNSON'S SHORELINE OF EMERGENCE, REVISITED, Rhode Island Univ., Kingston. Dept. of Geology.

Rhode istand Univ., Kingston, Dept. of Geology, J. J. Fisher. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 161-179, 1973. 7 fig. 2 tab, 17

Descriptors: "Geomorphology, "Coasts, "Barrier islands, "Sand bars, Beaches, Waves (Water), Littoral drift, Sand spits, Beach erosion, Sediment transport, Sedimentation, Currents (Water), Tides, Dunes. Identifiers: "Coastal geomorphology.

Johnson developed his classical theory relating the origin of barrier islands to shorelines or emergence using two hypotheses for the origin of barrier islands: one, in response to wave energy establishing a new profile of equilibrium on an emerging shoreline; and two, in response to longshore movement along a stable shoreline. Analysis by Johnson of 18 offshore 'projected' profiles along United States and European barrier islands indicated to him that his first hypothesis was the correct one. New coastal geomorphic field studies dicated to him that his first hypothesis was the correct one. New coastal geomorphic field studies
along the Virginia-North Carolina Outer Banks
coast suggest that parts of this barrier island chain
developed in response to longshore movement.
Recent field evidence from several coastal areas
has indicated that the classical Johnsonian theory relating the origin of barrier islands to 'shoreli of emergence' is in many cases invalid. (See also W73-07315) (Knapp-USGS) W73-07324

BARRIER AND LAGOON SYSTEMS ALONG THE ZULULAND COAST, SOUTH AFRICA, California Univ., Los Angeles. Dept. of Geog-

raphy.
A. R. Orme.
In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 181-217, 1973. 12 fig. 1 tab,

Descriptors: "Geomorphology, "Coasts, "Barrier islands, "Sand bars, Beaches, Waves (Water), Surf, Littoral drift, Sand spits, Beach erosion, Sediment transport, Sedimentation, Currents Sediment transport, Sedi (Water), Tides, Dunes.

Identifiers: *Coastal geomorphology, *Zululand Coast (South Africa).

The Zululand coast extends 320 km SSW from the Mozambique border to the Tugela River. The coast consists of long barrier beaches, surmounted by sand dunes up to 180 m high, behind which lie extensive swamps, lagoons, and old dune ridges. Shorezone dynamics are conditioned by prevailing northeasterly and southwesterly winds, by complex nearshore and coastal circulation systems, and by seasonally high sediment discharges from neighboring watersheds. Nearshore circulation patterns, consisting mainly of asymmetric cells, generate longshore currents exceeding 1 m/sec.

Inner and outer breaker zones reflect offshore bars. Beyond the nearshore circulation, reversing coastal currents related to the Agulhas Current system flow parallel to the shore with surface velocities of 0.2 to 0.8 m/sec, reduced by a factor of 0.4 near the seabed. During the winter dry eason, strong littoral drift creates barrier beaches across estuaries. During the summer rainy season, these barriers are breached and vast sediment plumes extend seaward and alongshore. The Tugela brings 10.5 million tons of sediment to the coast annually. Behind the coastal barrier ile Kosi Bay, Lake Sibayi, Lake St. Lucia, and Richards Bay, remnants of once extensive lagoons reduced by infilling and segmentation. Present sedimentation rates for Lake St. Lucia are three times the mean rate for the past 5.000 vr. Larsely due to action rates for Lake St. Lucia are three times the mean rate for the past 5,000 yr, largely due to ac-celerated erosion from misused Zululand watersheds. (See also W73-07315) (Knapp-USGS) W73-07325

EFFECTS OF EROSION ON BARRIER-ISLAND MORPHOLOGY, FIRE ISLAND, NEW YORK, Marathon Oil Co., Casper, Wyo.

K. Ruzvia.

In: Coastal Geomorphology, Proc of 3rd Ann Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 219-237, 1973, 11 fig. 5 tab.

Descriptors: *Beach erosion, *Barrier islands, *New York, *Surf, Waves (Water), Littoral drift, Currents (Water), Coasts, Geomorphology, Sediment transport.

Identifiers: *Coastal geomorphology, *Fire Island

Erosion of 3 to 5 ft per year occurred at Fire Island, New York, from 1959 to 1969. Surveys made during 1970 show that more than 65 ft of landward erosion occurred from July to December. Approximately 56,800 cu yd of material was eroded from the dune system, and approximately 18,000 cu yd of material was eroded from the berm along a 1,660 ft section of beach. Wave action is most directly responsible for the erosion. Neither berm, dunes, nor dune vegetation within the study area were altered by humans or beach vehicles during 1970. Major factors which may be controlling erosion at Fire Island and other east coast beaches are: (1) number of hurricanes and other severe storms, (2) custatic rise in sea level, (3) interference of natural shore processes by man, (3) interference of natural shore processes by man, and (4) lack of available beach material due to natural causes. Crescentic shoreline forms are relatively stable under conditions which normally relatively stable under conditions which normally result in erosion to straight portions of the beach. Fire Island is currently undergoing ravinement. The shallow marine facies is transgressing landward, while the lagoonal and dune facies are being reworked by wave action. (See also W73-07315) (Knapp-USGS) W73-07326

COMPARISON OF ECOLOGICAL AND GEOMORPHIC INTERACTIONS BETWEEN ALTERED AND UNALTERED BARRIER ISLAND SYSTEMS IN NORTH CAROLINA, ISLAND SYSTEMS IN NORTH CAROLINA, Massachusetts Univ., Amherst. Dept. of Botany. P. J. Godfrey, and M. M. Godfrey. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 239-258, 1973. 14 fig, 16 ref.

Descriptors: *Barrier islands, *North Carolina, *Beach erosion, *Geomorphology, *Coasts, *Land management, Surf, Waves (Water), Ecology, Marshes, Dunes, Sediment transport, Sedi-Identifiers: *Coastal geomorphology, *Outer Ranks (NC).

The Outer Banks of North Carolina are one of the world's best examples of a continuous offshore barrier system. Today they are faced with threats

from recreation and development programs. Because of the belief of many coastal managers that stabilization of dunes and beaches is essential to preserve the shoreline, undesirable changes are being made in the processes which create and maintain these islands. Some sections of the Outer Banks are still in a natural condition. The natural vegetation is adapted to prevailing conditions; its zonation depends upon elevation, distance from the sea, frequency of overwash, and salt exposure. This ecosystem is well able to withstand continuous natural stress. In artificial systems, both vegetation and developments are very close to the ocean. The vegetation is not able to handle overwash, and if a break in the dune occurs there is a major perturbation. Undeveloped seashores should be preserved in their natural condition. On managed seashores with no permanent structures, retreating beaches and dunes can be allowed to follow the natural course of events. A controlled overwash will build the island's interior and in the process beaches will widen. (See also W73-07315) (Knapp-USGS)

BARRIER ISLANDS: NATURAL AND CON-

TROLLED,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

mental Sciences.

R. Dolan.

In: Coastal Geomorphology, Proc of 3rd Annual
Geomorphology Symposia Series, Binghamton, N
Y, Sept 28-30, 1972, p 263-278, 1973. 12 fig, 12 ref.

Descriptors: *Barrier islands, *North Carolina, *Beach erosion, *Geomorphology, *Coasts, *Land management, Surf, Waves (Water), Ecology, Marshes, Dunes, Sediment transport, Sedi-

Identifiers: *Coastal geomorphology, *Outer

The Outer Banks of North Carolina extend from the Virginia-North Carolina border south to Cape Lookout, a distance of 240 km. These islands were originally one continuous biophysical system, but the upper section has experienced three decades originally one continuous biophysical system, but the upper section has experienced three decades of dune and beach stabilization, coupled with extensive public and private development. The southern segment, which includes Core Banks, remains in a natural state and is authorized to become the new Cape Lookout National Seashore. Natural barrier islands are much better adapted to steady-state processes and extreme events than are the man-manipulated islands. Since there is little resistance to the storm surge movement across the natural barriers, wave energy is dissipated Across the wide berm, among the low dunes, and finally in the grasslands and marshes behind. Within the stabilized segment of the Outer Banks, the massive and unbroken manmade dunes act as an impenetrable obstruction to a storm surge, so the energy dissipation and sediment transfer processes are significantly different. The most important differences are associated with the restrictions of the runup profile and the elimination of oceanic overwash. Overwash is the major means by which low barrier islands retract before the rising sea. It is the only way massive quantities of coarse sediment can be moved inland from the beach. (See also W73-07315) (Knapp-USGS)

BEACH PROFILE CHANGES ON WESTERN

LONG ISLAND, Army Coastal Engineering Research Center, Washington, D.C. C. H. Everts.

C. n. Everts. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 279-301, 1973. 10 fig, 3 tab, 9

Descriptors: *Beach erosion, *Sedimentation, *Sediment transport, *Geomorphology, *Coasts,

Group 2J-Erosian and Sedimentation

Littoral drift, Storms, Surf, Waves (Water), Barrier islands, New York, Profiles.
Identifiers: "Coastal geomorphology, *Long Island (NY), Beach profiles.

Island (NY), Beach profiles.

Ten beach profiles across a 9 mi section of straight coast in the vicinity of Jones Beach, New York, have been surveyed about 10 times per year since the great storm of March 1962. The study area, on the south shore of Long Island, has a restricted fetch from the west, is generally open to waves from the south and east, and is near the western (downdrift) end of a net longahore transport system. Two extensively studied storms in February 1972 appear to have moved large quantities of sand in opposite directions. On February 4, 1972, a storm deposited 45,000 cu yd from the study area while eroding 285,000 cu yd from the western two-thirds. Two weeks later another storm of similar intensity removed 365,000 cu yd from five eastern profiles and deposited 48,000 cu yd on the five western profiles. These data suggest that gross longshore transport rates in this area are much greater than net rates. In each storm, the amount deposited was approximately 15% of the total quantity eroded. The indicated direction of net transport during each storm correlates well with the principal wind directions during that storm. Such areal and temporal changes in beach profiles, if not anticipated, can affect the success of beach nourishment programs or the stability of protective shore structures. The reversing transport direction affects areas of deposition and erosion nounsament programs or the stability of protective shore structures. The reversing transport direction affects areas of deposition and erosion and must be considered in positioning structures and in the location of feeder beaches. (See also W73-07315) (Knapp-USGS)

COASTAL PROCESSES AND PREHISTORIC MARITIME CULTURES,
Western Washington State Coll., Bellingham

Western Washington State Coll., Bellingham. Dept. of Geology, M. L. Schwartz, and G. F. Grabert. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, N Y, Sept 28-30, 1972, p 303-320, 1973. 2 fig, 9 plates, 13 ref.

Descriptors: *Beaches, *Coasts, *Barrier islands, *Sand spits, *Archaeology, Washington, Sedimentation, Geomorphology, Fishing, Ecology, Stratigraphy, Sedimentary structures.

Identifiers: *Coastal geomorphology.

An interdisciplinary approach in scientific inquiry is well exemplified in the relationship between coastal processes and prehistoric maritime cultures. The archeologist may describe the culture of tures. The archeologist may describe the culture of a maritime people and the geomorphologist may interpret the processes that have taken place, but only the two, working in concert, can describe what life was like at the time and how the environwhat life was like at the time and how the environ-ment shaped the quality of that life. Five case stu-dies from the Puget Sound-Strait of Georgia region illustrate this thesis. A dig at the landward ter-minus of Semiahmoo Spit has uncovered gravel overlain by clay, both containing evidence of early habitation. The sequence suggests occupation of an exposed headland beach followed by activity carried out at a later stage in the sheltered lee of a developing smit Proceeding down the coast. carried out at a later stage in the sheltered lee of a developing spit. Proceeding down the coast, the next embayment, Birch Bay, is a classic example of a spiral headland bay beach. The stratigraphy in pits dug on a raised terrace at Cherry Point illustrate a succession from cobble beach to well developed soil horizon. The terrace was crossed by early fishermen when it was a beach, much like that which now lies at the case the that which now lies at the foot of the bluff, then reoccupied as a raised terrace in more recent times. Farther to the south lie the Conway and La Conner sites. A meandering distributary is complete with fishweir and willow-reed mats. An earlier inner midbay bar was occupied repeatedly between stages of inundation. (See also W73 07315) (Knapp-USGS)

MORPHOLOGY AND VERTICAL SEDIMENTA-RY SEQUENCE MODELS IN HALOCENE
THANGCHESTUP RADDIED SYSTEMS TRANSGRESSIVE BARRIER SYSTEMS, Delaware Univ., Newark. Dept. of Geology. J. C. Kraft, R. B. Biggs, and S. D. Halsey. In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, NY, Sept 28-30, 1972, p 321-354, 1973. 22 fig, 1 tab, 20 ref.

Descriptors: "Geomorphology, "Stratigraphy, "Coasts, "Sedimentary structures, Sedimentation, Barrier islands, Sand bars, Sand spits, Erosion, Beach erosion, Sediment transport, Estuaries. Identifiers: "Coastal geomorphology.

The transgressive barrier elements of the mid-Atlantic Delmarva Penninsula show four major types
of morphologic and vertical sedimentary
sequences. Each shows a response to present
wave and current conditions, as well as to the
topography inundated by the ongoing transgression. Because the present coastal transgression is
neart a product of late Holocene relative sea level
rise and in part the product of coastal erosion, vertical sequences and the sedimentary environment
lithosomes of the late Holocene stratigraphic
record at the edge of the transgression are in part
runcated by erosion are and incomplete. Linking
of studies of coastal processes, surface
geomorphic features, and subsurface stratigraphic
sections make possible a relatively complete understanding of the sequence of geomorphic events
that have occurred in the coastal zone during late
Holocene time. Model studies of the variants of
coastal morphologic units of the Delmarva Peninsula may be used to summarize the geologic history of the edge of the ongoing Holocene transgression. In addition, these models may be used to predict continuing changes in coastal morphology, assuming present and past processes will continuinto the future. These predictions are useful in understanding and developing a more effective use
of the coastal zone. (See also W73-07315) (KnappUSGS) W73-07331

COASTAL DUNES OF YOUNGER BERMUDA. State Univ. of New York, Binghamton. Dept. of

In: Coastal Geomorphology, Proc of 3rd Annual Geomorphology Symposia Series, Binghamton, NY, Sep 28-30, 1972, p 355-391, 1973. 20 fig, 7 tab, 31 ref.

Descriptors: *Seal level, *Dunes, *Stratigraphy, *Sedimentation, *Geomorphology, *Coasts, Sediment transport, Pleistocene epoch, Water level Identifiers: *Bermuda, *Coastal geomorphology.

Younger Bermuda is the collection of large dune-shaped hills along Bermuda's external shoreline. These lithified calcarenitic dunes retain their These lithified calcarenitic dunes retain their original depositional morphology and are easily distinguished from altered, older dunes which lie inland. Conditions necessary for the buildup of dunes on Bermuda are (a) relatively high sea levels so the strandline would be near the island and not below the edge of the platform, and (b) a source of large volumes of clacarenite. The factors determined use morphology are those that research large volumes of clacarenite. The factors determining dune morphology are those that prevented inland migration of the dunes. The direction of strong winds and gales that impinged on the shoreline controlled the direction of growth of the individual lobes. The Bermudian environment during dune formation was an interglacial environment like that of today. The platform was submerced. Carbonate-secreting organisms, including ment like that of today. The platform was sub-merged. Carbonate-secreting organisms, including hermatypic corals, were productive. The elements of geologic history that are of general significance involve the history of sea levels during Pleistocene interglaciations. Two separate intervals of rela-tively high sea level are recorded by the Paget rocks. The earlier of the two was about 125,000 yr ago. For the most part, sea level remained below its present position during this early Paget interval. Sea level did rise above present datum during this interval; the rise was abrupt and rapid and may signify a catastrophic surge in Antarctica. (See also W73-07315) (Knapp-USGS)

HYDROGEOLOGY OF LACUSTRINE SEDI-MENTS, BONNEVILLE SALT FLATS, UTAH, Texas Univ., Austin. L. J. Turk, S. N. Davis, and C. P. Bingham. Economic Geology, Vol 68, p 65-78, 1973. 6 fig, 4

Descriptors: "Utah, "Playas, Lake beds, "Hydrogeology, Brines, Saline water, Chloride, Magnesium compounds, Potassium compounds, Potash, "Aquifer characteristics, Transmissivity, Storage coefficient, Specific yield. Identifiers: "Lacustrine sediments, Solar evapora-tion, "Bonneville salt flats (Utah), Hydrochemis-

Bonneville Salt Flats is a large salt pan deposited by an intermittent playa lake in western Utah. Magnesium and potassium chlorides are recovered from brines collected in a system of ditches and concentrated in large solar evaporation ponds. Recharge to the brine system is by rain and saline well water. Some recharge to the area of brine production may come from overland flow during wet winters. The upper ten feet of the Bonneville adjunction of the production was considered to the constitution of the second tental production duction may come at the Bonneville sediments constitutes an aquifer of high transmissivity which is attributed to, first, the high hydraulic conductivity of the salt bed at the surface, second, fractures in some of the underlying layers of silty clay, and third, permeable lenses of sandsize brine-shrimp pellets. Transmissivities in parts of the aquifer exceed 50,000 gallons per day per fact. The occurrence of open fractures in silty clay. is explained either by osmotic desiccation of bu-ried clays induced by an increase in salinity of near-surface waters or by syneresis. (Smith-NWWA)

OUSPENDED SEDIMENT AND WATE CHARACTERISTICS, Naval Oceanographic Office, Washington, D.C. For primary bibliographic entry see Field 02L. W73-07387 WATED

MOUNDS IN LAKE TAHOE, CALIFORNIA--NEVADA: A MODEL FOR LANDSLIDE TOPOGRAPHY IN THE SUBAOUEOUS EN-

TUPOGRAPHY IN THE SUBAQUEOUS EN-VIRONMENT, Tulsa Univ., Oklahoma. Dept. of Earth Sciences. N. J. Hyne, C. R. Goldman, and J. E. Court. Journal of Geology, Vol 81, No 2, p 176-188, March 1973. 10 fig, 41 ref.

Descriptors: *Landslides, *Sedimentary structures, *Lakes, *California, *Bottom sediments, Turbidity currents, Earthquakes, Mudflows, Mass Masting. Identifiers: *Lake Tahoe (Calif).

Landslide movement of sediments is a significant mode of sediment transport in Lake Tahoe, California-Nevada. A series of massive, basin-wide landslides deposited a large portion of the thick bottom sediments. The latest of these landslides was comparable in volume with the largest landslides ever recorded. Several large mounds on the floor of Lake Tahoe were formed by landslides. At the base-of-slope environment, many mounds are well layered and rotated backward, suggesting deposition as coherent slump blocks. Mounds further from the base of slope are circular or elliptical in area, have a pebbly mudstone sedimentary texture, display a disordered internal structure on seismic reflection profiles, and are located on an extensive layer of similarly disordered sediments. These mounds formed along de-Landslide movement of sediments is a significant

Erosion and Sedimentation-Group 2J

watering centers during the rapid deposition of an incoherent landslide mass. A gradation exists between coherent slumps, partially fluidized incoherent landslide masses, and fluidized turbidity currents depending on the amount of water that has been entrained. Only the fluid flow does not form a characteristic mound topography. (Knappose) IISUS)

STABLE ISOTOPE TRACING OF COASTAL IDE, Old Dominion Univ., Norfolk, Va. Inst. of

Oceanography.
For primary bibliographic entry see Field 02L.
W73-07401

DELTAIC ACTIVITY OF BHAGIRATHI-HOOGHLY RIVER SYSTEM, Calcutta Port Commissioners, (India). Hydraulic

For primary bibliographic entry see Field 02L.
W73-07405

FIELD INVESTIGATIONS OF THE CHANNEL PROCESS (NATURNYYE ISSLEDOVANIYA RUSLOVOGO PROTSESSA), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Yu. M. Korchokha.

Iu. Richerodana.
In: Eksperimental'nyye gidrologicheskiye iss-ledovaniya na Valdaye; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 176, p 165-175, Leningrad, 1969. 5 ref.

Descriptors: *On-site investigations, *Channels, *Channel morphology, *Channel erosion, Banks, Beds, Meanders, Flood plains, Dunes, Sediments, Sediment discharge, Turbidity, Equations.
Identifiers: *USSR, *Polomet' River.

are presented of investigations of morphologically homogeneous reaches and of large and small channel forms in the Polomet large and small channel forms in the Potomet's River, a right tributary of the Pola River, in northwest European Russia. Observations are made of sediment discharge, and relations are derived to calculate sand-dune characteristics and movement. (Josefson-USGS) W73-07407

COARSE-SEDIMENT A COARSE-SEDIMENT TRANSPORT RECORDER (REGISTRATOR DVIZHENIYA KRUPNYKH NANOSOV), Gosudarstvennyi Gidrologicheskii Institut, Lenin-grad (USSR). N. Ya. Solov'yev.

In: Voprosy ucheta stoka po gidrometricheskim dannym i gidrologicheskiye pribory; Gosudarst-vennyy Gidrologicheskiy Institut Trudy, No 172, p 90-95, Leningrad, 1969. 2 fig, 4 ref.

Descriptors: *Instrumentation, *Sedimentation, *Sediment transport, *Sediment discharge, *Coarse sediments, Particle size, Bed load, Flow. Identifiers: *USSR, *Bedload gages.

A device was constructed by the State Hydrologic Institute in 1968 for remote recording of coarse sediments moving by saltation at the bottom of mountain streams. It records sediment particles weighing between 20 and 300 g and moving in bottom flow at a velocity of 1 to 3 m/sec. The transtom flow at a velocity of 1 to 3 m/sec. The trans-ducer, which is lowered to the bottom of flow dur-ing measurement, converts the energy of each par-ticle collision into an electrical signal, which is recorded on the film of a light-beam oscillograph. The strength of the signal is proportional to the collision force, and the weight of the particle can be determined from the particle speed at the mo-ment of impact. The device can be used for investigation of bedload transport and for determination of coarse-sediment discharge and grain-size distribution. (Josefson-USGS) W73-07408

LANDSLIDES ON THE LEFT BANK OF THE CHIRCHIK RIVER (OPOLZNI LEVOBEREZH-'YA R. CHIRCHIK),

A A. CHIRCHIA, Institute of Hydrogeology and Engineering Geolo-gy, Tashkent (USSR). M. M. Mengilbayev, and R. A. Niyazov. Uzbekskiy Geologicheskiy Zhurnal, No 5, p 71-73,

1969, 2 fig. 1 ref.

Descriptors: *Landslides, *Slopes, *Slope stabili-ty, Precipitation (Atmosphene), Groundwater, Earthquakes, Eagineering geology, Mining en-gineering, Surveys. Identifiers: *USSR, *Chirchik River, Tectonics.

Geologic-engineering surveys were carried out along the Chirchik River in Uzbekistan in 1964-69 for investigation of landslide occurrence and development. The factors responsible for the origin of landslides are atmospheric precipitation, groundwater, slope stability, seismic phenomens, and human activity. Over half of the number of slides have occurred on slopes with a gradient of 30 to 40 deg. A relation is established between rainfall and landslide frequency. Groundwater, earthquakes, and mining operations are also discussed in terms of their importance to promotion of slope movement. (Josefson-USGS) W73-07412

CONTROL OF SILTING IN RESERVOIRS ON

MOUNTAIN RIVERS, Politekhnicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 04D.

CALCULATION OF THE PROCESS OF SEDI-MENTATION AND HYDRAULIC WASHOUT OF RIVER RESERVOIR, Akademiya Nauk Armyanskoi SSR, Erevan. In-stitut Agrokhimicheskikh Problem i Gidroponiki. V. G. Sanoyan.

Sutut Agrokamine-estata Problem i Garopomat.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of Intenational Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 5-8, 1972 (release date). 4 fig.

Descriptors: "Desilting, "Reservoir silting, "Sediment control, "Numerical analysis, Bed load, Suspended load, Erosion, Scour, Sedimentation, Model studies, Hydraulic models.

In order to solve the equation describing the process of silting and scouring of reservoirs, first the integral convective exchange is established, taken over all the moving volume. The following may be determined: the contour of the reservoir bottom, type of the free water surface curve, and the distribution of particles according to coarseness in any site and at any moment. The equations may also be used to calculate washouts. In this case, the water level should be considered variable. (Knapp-USGS)

VARIATIONS IN THE SOLID DISCHARGE ALONG THE LENGTH OF THE SEDIMENTA-TION ZONE DURING SILTING OF RESER-VOIRS,

Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).

V. A. Melentvey

Descriptors: *Sedimentation rates, *Silting, *Reservoir silting, Deltas, Deposition (sediments), Sediment load, Sediment discharge, Streamflow,

Sediment transport, Suspended load, Bed load, Regiment, Sedimentation, Silts

Regiment, Sedimentation, Silts.

In hydraulic structures erected by the hydraulic fill method the formation of underwater soil deposits is similar to that of deltas in rivers transporting large amounts of sediments. Therefore, the relationships known for the formation of soil deposits being shiced into structures may be extended with a fair degree of accuracy to sediment deposits developing in reservoirs and deltas of rivers falling into lakes and seas. The path of particles in the reservoir depends on the mean flow velocity. The shape of the surface profile is greatly affected by the grain size and specific gravity of sediments, therefore it is expedient to assume the fall velocity of particles as a generalizing parameter. The deposition of sediments and, consequently, the configuration of their surface profile seems to be affected by the amount of solids contained in the flow entering the reservoir. (Knapp-USGS)

EXPERIMENTAL STUDY OF RESERVOIRS WITH DENSITY CURRENTS FORMED DURING THE FLOOD, CALCULATION PRINCIPLES FOR SILTING OF SUCH RESERVOIRS, Politekhnicheskii Institut, Leningrad (USSR). N. P. Kulesh.

N.F. Kuesh.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 13-16, 1972 (release date). 2 fig.

Descriptors: *Sedimentation rates, *Silting, *Reservoir silting, *Density currents, Deltas, Deposition (sediments), Sediment load, Sediment discharge, Streamflow, Sediment transport, Suspended load, Bed load, Regimen, Sedimentation, Silts.

In the Soviet Union some rivers, including the Amu-Darya, Syr-Darya, Samur, Sulak, and Inguri, transport large amounts of sediments (from 3 kg/cum to 40 kg/cum). During the flood, fine fractions are predominant. The reservoir silting process of these rivers is a very peculiar one. A density current forms in a reservoir if the concentration of the finer sediment equals 1-2 kg/cum. Having entered the reservoir, a sediment-loaded current heavier than the surrounding water drops to the bottom and moves to the dam. Here the current either wholly or partially escapes downstream. In either case the intensity of silting adiacent to the dam is markedly decreased. The adjacent to the dam is markedly decreased. The density current is characterized not only by higher density (as compared to that of the ambient fluid) but also by higher viscosity. The coarner fraction material will deposit and create a deposition cone in the zone of the backwater. These phenomena result in: (a) building up of the load on the dam upstream face due to increased density and volume of silt deposit in front of it; (b) more intensive abrasion of conduit walls and elements of turbine waterways by entrained solid particles; (c) partial loss of the operating volume of the reservoir due to the progress of the deposition cone; (d) enlargement of the flood area owing to the rise of reservoir water level. (Knapp-USGS) adjacent to the dam is markedly decreased. The

STUDIES OF STORAGE WORK SILTING OF HYDROELECTRIC POWER PLANTS ON MOUNTAIN RIVERS AND SILT DEPOSITION

FIGHTING, L. G. Gvelesiani, and N. P. Shmal'tzel.

L. O. Gvetesiam, and N. P. Simmai tzel.

In: Hydraulic research and its impact on the environment, Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 17-20, 1972 (release date).

Descriptors: *Desilting, *Reservoir silting, *Sediment control, Bed load, Suspended load, Erosion.

Group 2J-Erosion and Sedimentation

Scour, Sedimentation, Model studies, Hydraulic models.
Identifiers: *USSR (Transcaucasia).

Studies of problems of silt deposition fighting in head races and hydroelectric power plants storage works have been carried out during a number of years under natural conditions in mountain rivers abundant in silts. The studies include more than 20 abundant in silts. The studies include more than 20 storage works of Transcaucasia (Georgia, Azebaijan, Armenia) and of North Caucasus. Many storage works were filled with silts after 3-6 years, mostly due to suspended silts. Hydraulic flushing by means of optimal water discharges, at the lowest water level possible in the head race, was found to be most efficient against silt deposition. The values of optimal water discharges at such a grocedure were determined; recommends such a procedure were determined; recommenda-tions are given for the conditions of deeply situ-ated flushing holes. (Knapp-USGS) W73-07305

AN EXPERIMENTAL INVESTIGATION OF RESERVOIR SEDIMENTATION, Windsor Univ. (Outario). Dept. of Civil Engineer-

S. P. Chee, and A. P. Sweetman.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 21-24, 1972 (release date).

Descriptors: "Sedimentation rates, "Silting, "Reservoir silting, "Hydraulic models, Deltas, Deposition (sediments), Sediment load, Sediment discharge, Streamflow, Sediment transport, Suspended load, Bed load, Regimen, Sedimentation Silve

An investigation of reservoir sedimentation was made with the aid of a hydraulic model. The significant features of reservoir siltation studied in cluded the manner of advance and the slope of the sediment beds. A comparison of sediment slopes was made based on the observed values and those computed from the bed load equations. One of the detrimental aspects of reservoir siltation is its enoccumiental aspects of reservoir sination is its en-croachment on flood storage; the magnitude and severity of this effect depends on the manner of advance and, in particular, the slope of the sedi-ment beds. The equations of Einstein and Kalinske gave the closet results with no appreciable dif-ference between them. (Knapp-USGS) W73-07506

PROTECTION OF OFFTAKE WORKS AGAINST SILTING-UP, CALEDON-WELB-EDACHT DAM, Department of Water Affairs, Pretoria, (South

Africa). Design Div.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 25-28, 1972 (release date). 1 fig, 1 ref.

Descriptors: *Sediment control. *Outlets. *Reservoirs, *Bed load, *Hydraulic models, *Groins (structures), Scour, Reservoir operation, Reservoir desilting, Sediment discharge, Meanders,

Identifiers: *South Africa. *Caledon-Welbedacht dam (So Afr.).

A model investigation was carried out to detere to what extent river sand and silt could be deflected away from the water supply offtakes situated adjacent to the flood control works of Welbedacht Dam, South Africa. This dam is a run of-river barrage structure with 5 sluice gates and providing pool level control and small storage for short-terr drawoff. Rejection of silt via the flood gates could be improved by providing two diagonal deflector groins or walls upstream of the dam to induce a meander pattern. The offtake works are where the tendency would be to scour rather than to deposit. The deflector wall just upstream the dam is in fact the remaining portion of the cofferam purposely left in place to deflect the current past the offtakes toward the flood gates. (Knappiters) USGS)

MEANS OF PREVENTING LOSS OF RESERVOIR CAPACITY THROUGH SEDIMENTA-

ecticut Univ., Storrs.

Connecticut Univ., Storts.
C. J. Posey.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 29-30, 1972 (release date).

Descriptors: *Erosion control, *Alluvial channels, *Particle size, Bank protection, Coatings, Riprap, Channel erosion, Filters, Porous media, Scour.

To prevent bed and bank erosion watercourses can be protected by impervious linings of asphalt or concrete. Disadvantages, in addition to the high cost, are that velocities are increased, sediment is transported with maximum ease, and if the lining is overtopped destruction is rapid. Another solution is to line the channels with rocks or cast blocks large enough to resist being moved by the flood currents. Movement of underlying fine sediments can be prevented if the soil is protected by a layer or successive layers of material meeting the Terzaghi-Vicksburg specifications for a reverse filter. Procedures tentatively recommended by the U. S. Highway Research Board for noneroding ditch linings are similar. (Knapp-USGS)

SEDIMENTARY PROCESSES IN RESERVOIRS, Bristol Univ. (England). Dept. of Civil Engineer-

S. Buttling, and T. L. Shaw.

S. Butting, and T. L. Shaw.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Vol 5, p 31-34, 1972 (release date). I fig.

Descriptors: *Reservoir silting, *Reviews, *Sedimentation, *Density stratification, Deposition (sediments), Density currents, Sediment transport, Deltas, Thermal stratification, Stratified flow, Suspended load, Bed load, Sediment convey.

The processes of sediment deposition in reservoirs are reviewed. Interaction between thermal, solution, and suspension effects on the characteristics of particle motion in density currents is discussed. Few reservoirs have a useful life of less than 100 years. Since this is much beyond the period for financial return associated with such projects, the omist will not see it as a factor for considtion. Loss of storage volume may not be simply through the settling out of material in the deepest water. A more immediate problem is that deltain water. A more immediate problem is that deltaic formations reduce 'live' capacity, an event likely to occur more frequently with constructions in the lower reaches of rivers and in estuaries. The pumped-storage type of scheme, which extracts water from the lower reaches for local elevated retention in reservoirs, is another example of how live storage may be sacrificed, because it is common practice to abstract from near river banks, hence drawing in the coarser bed-load material.

Considering the steady state flow of a stream into a reservoir, the formation of a density current will depend on the levels of temperature, salinity, and sediment concentration relative to the ambient sediment concentration relative to the ambient fluid body. Typically reservoirs are stratified, which suggests that a current that is nonbuoyant at

the surface may achieve a state of neutral buoyan-cy at some depth below the surface, at which it will establish an interfacial layer. (Knapp-USGS)

A PROPOSED MEASURE FOR PREVENTION OF VORTEX IN THE ASPIRATOR OF A REAC-TION TURBINE (PROPOSITION D'UNE ME SURE POUR EVITER IA TORQUE DANS PASPIRATEUR D'UNE TURBINE A REAC-

TORNIA TEUR D'UNE TURBIRE A REAC-TION), Technische Universitaet, Munich (West Ger-many). Institut fuer Hydraulische Maschinen und Anlagen. For primary bibliographic entry see Field 08B. W73-07510

DECREASE IN CAVITATION EROSION INTEN-SITY FOR HIGH-HEAD GATES BY USING THE

SITY FOR HIGH-HEAD GATES BY USING THE SUPERCAVITATING STRUCTURES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenia i Inzhenernoi Gidrogeologii, Moscow (USSR).
For primary bibliographic entry see Field 08B.
W73-07511

HYDRAULIC STRUCTURES OPERATION UNDER CAVITATION CONDITIONS, All-Union Designing Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR). For primary bibliographic entry see Field 08B. W73-07512

STUDY OF CAVITATION ON BLADES OF A HIGH-HEAD ADJUSTABLE-BLADE WATER

TURBINE, Tsentralnyi Nauchno-Issledovatelskii Kotloturbinnyi Institut, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-07513

CAVITATION TESTS ON BAFFLE PIERS AND BUCKET SPLITTERS OF SPILLWAY HYDRAU-

LIC STRUCTURES, Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). For primary bibliographic entry see Field 08B. W73-07514

INVESTIGATION OF RELATIVE CAVITATION RESISTANCE OF MATERIALS AND PROTEC-TIVE COATINGS AND DEVELOPMENT OF MEASURES AGAINST CAVITATION EROSION OF HYDRAULIC STRUCTURE ELEMENTS, Vsesoyuznyi Nauchno-Isasedovatelskii Ins Gidrotekhniki, Leningrad (USSR). For primary bibliographic entry see Field 08B. W73-07515

CAVITATION IN STILLING BASIN APPUR-TENANCES, Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 08B.
W73-07516

CAVITATION DAMAGE DOWNSTREAM CAVITATION DAMAGE DOWNSTREAM FROM OUTLET WORKS GATES, Bureau of Reclamation, Denver, Colo. Engineer-ing and Research Center. For primary bibliographic entry see Field 08B. W73-07517

CAVITATION DAMAGE AT KINZUA DAM, AL-LEGHENY RESERVOIR, Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 08B.

CAVITATION CONTROL IN AN ENERGY DIS-SIPATION STRUCTURE, Birmingham Univ. (England). Dept. of Civil Enineering. For primary bibliographic entry see Field 08B. For primar W73-07519

THE INCEPTION OF CAVITATION IN A CENTRIFUGAL PUMP DETECTED BY THE ANALYSIS OF THE PRESSURE PULSATIONS GENERATED BY THE MACHINE, Genoa Univ. (Italy). Inst. of Hydraulics. For primary bibliographic entry see Field 08B. W73-07520

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ROLE OF FLOOD PLAIN IN FLOOD DISCHARGE OF A RIVER CHANNEL, Gidrometeorologicheskii Institut, Leningrad (USSR). N. B. Barishnikov, G. V. Ivanov, and Yu. N.

Sokolov.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 141-144, 1972 (release date). 2 fig, 4 ref.

Descriptors: *Flood plains, *Floods, *Discharge (Water), *Hydraulic models, *Overflow, Hydraulics, Streamflow, Stage-discharge relations, Floodways, Deposition (Sediments), Flood flow, Model studies, Flow characteristics, Flow rates.

The problems of interaction between the flow in the channel of a river and that over its flood plain having parallel axis are studied thoroughly, and abundant literature is available. Less investigated are the problems of interaction of an overflow from flood plain into channel and the problems of interaction for flows with intersecting axes. A interaction for flows with intersecting axes. A interaction for flows with intersecting axes. A hydraulic model was made with two symmetrical flood plains of a width of 100 cm each. The channel and flood plains were modeled to have their axes both parallel and intersecting at angles of 30 and 60 deg. A reduction in the discharge capacity of the flow by an amount of up to 10-16% may be attributed to its channel component. This reducattributed to its channel component. Ins reduc-tion is due to the expenditure of energy in forming vortexes and shifting them in transverse directions. Discharges in river channels having flood plains reduce sharply where the axes of the flows intersect. The value of the discharge reducflows intersect. The value of the discharge reduc-tion as a whole is directly dependent on the angle of intersection of the axes of the flows and may drop twofold. Another matter to be taken into con-sideration when dealing with rivers that have the axes of flows intersecting at angles approaching 90 deg is the movement of sediment tending to fill the main channel. (Knapp-USGS)

INTERACTION OF CHANNEL AND FLOOD-PLAIN STREAMS, Moskovskii Institut Inzhenerov Zheleznodorozh-

mogo Transporta (USSR).
For primary bibliographic entry see Field 02E.
W73-07522

THE DAM-BREAK PROBLEM, Tennessee Univ., Knoxville. For primary bibliographic entry see Field 08B. W73-07523

FURTHER DEVELOPMENT OF THE IMPLICIT DIFFERENCE SCHEME FOR FLOOD WAVE CALCULATION,
Technische Hogeschool, Delft (Netherlands).
For primary bibliographic entry see Field 02E.

THE INFLUENCE OF VALLEY GRAVELS ON THE MOVEMENT OF A FLOOD WAVE, Hydraulics Research Station, Wallingford (En-

A. J. M. HATTSON.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 187-191, 1972 (release date). 1 fig, 1 tab, 5 ref.

Descriptors: *Flood waves, *Surface-groundwater relationships, *Alluvial channels, Hydraulic models, Infiltration, Hydrogeology, Aquifers, Stage-discharge relations, Hydrographs.

Many river valleys are filled with highly permeable deposits of sands and gravels, so that when the river level rises or falls a significant quantity of water can flow into or out of the valley aquifer. The volume of water temporarily stored in this way influences the shape of a flood wave as it propagates down the river. Both the speed and the peak height of a model wave are reduced if such an interchange of water can take place. The model results were confirmed by comparing the stage-time records of a flood wave in a river having a permeable flood plain with similar records in a hydraulic model of the same river in which the bed and banks were impermeable. (Knapp-USGS) W73-07525

COMPUTATION OF EXTREME FLOODS IN A LARGE RESERVOIR,
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 02E.
W73-07526

A MODEL FOR FLOOD COMPUTATIONS IN THE PARANA AREA,
For primary bibliographic entry see Field 04A.
W73-07527

NUMERICAL ANALYSIS OF FLOW IN LAVER

NUMERICAL ANALYSIS OF FLOW IN LAVER CULTURE FARM, National Research Institute of Agricultural En-gineering, Hiratsuka (Japan). Div. of Fisheries En-gineering. For primary bibliographic entry see Field 02E. For primary W73-07528

MATHEMATICAL MODELS AND THEIR USE IN WATER RESOURCES DECISION-MAKING, Resources Research Centre, Ottawa (Ontario). For primary bibliographic entry see Field 06A. W73-07529

GREAT LAKES SIMULATION MODEL-A DECISION AID,
Department of the Environment, Ottawa (Ontario). Water Management Service.
For primary bibliographic entry see Field 06A.
W73-07530

APPLICATION OF HYDROLOGIC SIMULA-TION TO WATER RESOURCES PLANNING, Hydrocomp International, Palo Alto, Calif. For primary bibliographic entry see Field 06A. W73-07531

STOCHASTIC ANALYSIS OF HYDROLOGIC SYSTEMS, Illinois Univ., Urbana. Hydrosystems Lab. For primary bibliographic entry see Field 02A. W73-07532

SOLUTION OF PROBLEMS ON INFILTRA-TION WITH SIMULTANEOUS CONSIDERA-

TION OF THE FLUID MOVEMENT BOTH IN SATURATED AND UNSATURATED ZONES OF

SATURATED AND UNSATURATED ZONES OF THE SOIL, Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR). For primary bibliographic entry see Field 02G, W73-07533

ON THE DETERMINATION OF HYDRAULIC CONDUCTIVITY OF UNSATURATED SOILS IN

SITU, Technical Univ. of Istanbul (Turkey). Div. of Hydraulic and Water Power. For primary bibliographic entry see Field 02G. W73-07534

VERTICAL INFILTRATION DUE TO CONSTANT RAINFALL INTO NON-SATURATED SOILS,

Osaka Univ. (Japan). For primary bibliographic entry see Field 02G. W73-07535

METHOD OF EVALUATION OF WATER BALANCE IN SITU USING WATER CONTENT AND INTERSTITIAL PRESSURE (METHODE D'EVALUATION DU BILAN HYDRIQUE IN SITU A PARTIR DE LA MESURE DES TENEURS EN EAU ET DES PRESSIONS IN-TERSTITIELLES), Universite Scientifique et Medicale de Grenoble

For primary bibliographic entry see Field 02G. W73-07536 (France).

CONSTANT FLUX INFILTRATION IN A VER-TICAL COLUMN OF STRATIFIED SOIL-CONSTANT FLOX INFILITATION IN A VER-TICAL COLUMN OF STRATIFIED SOIL— INFLUENCE OF THE COMPRESSION OF AIR (INFILITATION A DEBIT CONSTANT DANS UNE COLONNE VERTICALE DE SOL STRATIFIEE—INFLUENCE DE LA PRESSION DE L'AIR), For primary bibliographic entry see Field 02G. W73-07537

SEEPAGE THROUGH UNSATURATED POROUS MEDIA,
Research Inst. for Water Resources Development, Budapest (Hungary). For primary bibliographic entry see Field 02G. W73-07538

HYDRAULIC MODEL STUDY FOR IN-VESTIGATING KARSTIC WATER MOVE-

WESTIGATING KARSTIC WATER MOVE-MENTS, Research Inst. for Water Resources Development, Budapest (Hungary). For primary bibliographic entry see Field 02F. W73-07539

PERIGLACIAL MUDSLIDES IN VESTSPIT-SBERGEN AND THEIR BEARING ON THE ORIGIN OF FOSSIL 'SOLIFLUCTION' SHEARS IN LOW ANGLED CLAY SLOPES, Imperial Coll of Science and Technology, London (England). Dept. of Civil Engineering. R. J. Chandler.

Quarterly Journal of Engineering Geology, Vol 5, No 3, p 223-242, 1972. 12 fig, 4 plate, 3 tab, 22 ref.

Descriptors: "Solifluction, "Landslides, "Mud flows, "Pore pressure, "Mass wasting, "Arctic, Degradation (Slope), Clays, Faults (Geologic), Shear, Slope stability, Soil moisture, Soil water, Freezing, Thawing. Identifiers: "Spitsbergen.

Mudflows of very silty material occur on slopes in the range 8 1/2 deg to 12 deg. In the stress range within which these flows occur, the angle of shear-

Group 2J-Erosion and Sedimentation

ing resistance is at least 36 deg, so that for movement to have been initiated on slopes less steep than about 16 deg to 18 deg, substantial artesian pore pressures should exist. Both electrical and standpipe piezometer observations confirmed the existence of artesian pressures in this slope. This observation is consistent with stability analyses carried out using the measured soil strengths. (Knapp-USGS)

THE MORPHOLOGY OF DEGRADED LAND-SLIDE SLOPES IN SOUTH WEST DORSET, King's Coll., London (England). Dept. of Geography.

hang a Traphy.

D. Brunsden, and D. K. C. Jones.
Quarterly Journal of Engineering Geology, Vol 5,
No 3, p 205-222, 1972. 6 fig., 2 plate, 20 ref.

Descriptors: *Landslides, *Degradation (Slope), *Mass wasting, Erosion, Geomorphology, Topography, Mapping, Surveys, Slope stability. Identifiers: *Dorset (England).

Escarpments that have been affected by mass movement activity are widespread in Britain. Such slopes are potential hazards if disturbed by engineering activity. Geomorphological techniques, including morphological mapping and profiling have been used to investigate the distribution of old landslides on the southern slopes of the Char valley in West Dorset. Fourteen active slides occur in three topographic positions. Seven slumps have recently occurred in the banks of the River Char on the outside edge of small meanders. A large, shallow slab slide approximately 150 m wide and 90 m long is located at the back of the River Char floodplain. It has a small fresh scar 0.5 to 1.5 m deep, developed at the head of 1a 15 deg slope. Immediately upslope from Bellair (379937), a very shallow translational slide has recently occurred but has only just broken the grassed surface. A period of soliffuction led to the development of the extensive convexo-concave slopes. The whole slope from the Foxmould escarpment to the River Char can be considered as a major transportational slope and the surface form clearly demonstrates the importance of landsliding in the topographical evolution of the area. The morphology of the upper slopes of Stone Barrow Down indicates the polycyclic nature of landslide activity in the area, with evidence for at least three phases of movement. (Knapp-USGS)

THE GEOTECHNICAL CHARACTERISTICS OF A SPOIL HEAP AT YORKSHIRE MAIN COLLIERY, Durham Univ. (England). Dept. of Geology. For primary bibliographic entry see Field 05B. W73-07542

CHAPTER V: SEDIMENT CONTROL METHODS: C. CONTROL OF SEDIMENT IN CANALS.

American Society of Civil Engineers, New York. Task Committee for Preparation of the Sedimentation Manual.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY9, p 1647-1689, Sept 1972. 20 fig, 1 tab, 37 ref, append.

Descriptors: *Canals, *Desilting, *Sediment control, Bed load, Channels, Diversion structures, Hydraulic models, Hydraulics, Scour, Sedimentation, Settling basins, Sluices, Streamflow, *Suspended sediments, Streams, Velocity, Dredging, Sediments, Sediment transport, Canal design.

Identifiers: Sediment excluders, Diversion works, Ejectors, Headworks.

Sediment transported by natural streamflow has often presented major problems to the canal designer. To prevent clogging and costly maintenance operations, sediment must be removed from the water at the canal intake or transported through the canal system with a minimum of accumulation within the canal prism and structures. Complete elimination of the sediment at the diversion point generally is impractical and too costly in most cases. However, a combination of sediment control at the headworks and design of canal hydraulics to minimize deposition through the canal length can be used to provide practical solutions to the problem Some factors to be considered in canal design are: (1) amount and type of sediment to be removed or carried into the canal system, (2) type of earth materials through which the canal is to be constructed, and (3) type of ling, when used. Structures that reduce the amount of bedload entering canals are diverters or ejectors; to remove suspended small particles, some type of settling basin placed in the canal just downstream from the headworks is used. Several structures are shown and discussed. (USBR) W73-07549

HEAVY METAL LEVELS OF OTTAWA AND RIDEAU RIVER SEDIMENTS, Department of the Environment, Ottawa (Ontario). Inland Waters Branch. For primary bibliographic entry see Field 05B. W73-07588

STRENGITE DISSOLUTION IN FLOODED SOILS AND SEDIMENTS, Louisiana State Univ., Baton Rouge. Dept. of Agronomy. For primary bibliographic entry see Field 05B. W73-07595

SIGNIFICANCE OF PHOSPHORUS IN LAKES AND COASTAL WATER SEDIMENTS AND BENTHOS, Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland). For primary bibliographic entry see Field 05B. W73-07610

SEDIMENT CONTROL METHODS: D. RESER-VOIRS. American Society of Civil Engineers, New York. Task Committee for Preparation of the Sedimentation Manual.

For primary bibliographic entry see Field 04D. W73-07670

NILE DELTA: THE DEFUNCT PELUSIAC BRANCH IDENTIFIED, Geological Survey of Israel, Jerusalem. For primary bibliographic entry see Field 02L. W73-07673

REGULATION OF LONGSHORE SEDIMENT TRANSPORT (REGULIROVANIYE VDOL'-BEREGOVOGO POTOKA NANOSOV), Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
For primary bibliographic entry see Field 02L. W73-07681

USE OF AERIAL PHOTOGRAPHS IN MUD-FLOW INVESTIGATIONS (AEROMETODY IZUCHENIYA SELEY), All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR). For primary bibliographic entry see Field 07B. W73-07683 WAVE RESONANCE NEAR SHORES, Wisconsin Univ., Madison. Dept. of Mathematics. For primary bibliographic entry see Field 02E. W73-07724

POTENTIAL OF ERODING SOILS FOR THE PHOSPHORUS ENRICHMENT OF STREAMS, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W73-07725

PLANS FOR REDUCTION OF SHOALING IN BRUNSWICK HARBOR AND JEKYLL CREEK, GEORGIA; HYDRAULIC MODEL INVESTIGA-TION.

TION,
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-07728

GEORGETOWN HARBOR NAVIGATION STU-DY.

Corps of Engineers, Washington, D.C. Committee on Tidal Hydraulics.

Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, June 1972. 24 p, 2 plates.

Descriptors: *Channel improvement, *Shoals, *Harbors, *South Carolina, *Jetties. Identifiers: *Navigation channels, *Georgetown Harbor (S.C.), *Maintenance dredging.

Committee on Tidal Hydraulics recommended model study of inner harbor to estimate the increased maintenance dredging that would be required for a 35-ft navigation channel project and to determine the modifications that might be required to the existing jetties to offset possible increased maintenance resulting from the deeper channel. (Spivey-WES) WT3-07735

2K. Chemical Processes

ENVIRONMENTAL CHEMISTRY, Missouri Univ., Columbia. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07171

SUCCESSIVE DISPLACEMENTS OF (3) H2O AND (36) NACL THROUGH STERILIZED AND UNSTERILIZED SOIL COLUMNS, Florida Univ., Gainsville. For primary bibliographic entry see Field 02G. W73-07229

BACTERIAL ORIGIN OF SULFURIC ACID IN GEOTHERMAL HABITATS, Wisconsin Univ., Madison. Dept. of Bacteriology. J. L. Mosser, A. G. Mosser, and T. D. Brock. Science, Vol 179, No 4080, p 1323-1324, March 30, 1973. 1 fig, 1 tab, 10 ref. NSF Grant GB-35046.

Descriptors: *Sulfur bacteria, *Aquatic microorganisms, *Hot springs, *Oxidation, Weathering, Soil formation, Stable isotopes, Water chemistry, Biochemistry, Biochemistry: *Sulfolobus.*

Natural populations of Sulfolobus, a new genus of bacteria occurring in sulfur-rich, acid hot springs and soils, oxidize large amounts of sulfur to sulfuric acid at temperatures up to 85 deg C. These bacteria are important high-temperature geochemical agents in solfatara soils. (Knapp-USGS)

A COLUMN CATION-EXCHANGE-CAPACITY PROCEDURE FOR LOW-EXCHANGE-CAPA-CITY SANDS, Battelle-Pacific Northwest Labs., Richland,

Mash. R. C. Routson, R. E. Wilding, and R. J. Serne. Soil Science, Vol 115, No 2, p 107-112, February 1973, 3 fig. 3 tab, 11 ref.

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Descriptors: *Cation exchange, *Ion exchange, *Soil chemistry, Laboratory tests, Leaching, Sorption, Soil chemical properties, Salinity, Tracers, Radioactivity techniques, Radioistotopes. Identifiers: *Cation exchange capacity.

A rapid and sensitive cation exchange capacity (CEC) column procedure is described for measuring the CEC of calcareous low-exchange-capacity sands and sandy soils. Entrained salt is removed by washing with an aqueous polyelectrolyte solution. Hydrolysis errors are minimized by limiting the amount of washing solution. A simple technique is described for estimating the extent of washing required. The precedure eliminates the replacement of the index cation, is amenable to the rapid measurement of CEC on large numbers of samples, and is sufficiently precise of the measurement of low-exchange-capacity sands. (K-napp-USGS)

WATER RESOURCES DATA FOR KANSAS, 1971: PART 2. WATER QUALITY RECORDS. Geological Survey, Lawrence, Kans. For primary bibliographic entry see Field 07C. W73-07255

ON THE USE OF SODIUM BICARBONATE WATERS AS DRINKING WATER, Novosibirsk Public Health Research Inst. (USSR). For primary bibliographic entry see Field 05C. W73-07311

HYGIENIC EVALUATION OF ARTESIAN WATERS USED FOR UTILITY AND DRINKING WATER SUPPLY IN THE TEREKSULAK LOWLAND, Dagestanskii Meditsinskii Institut, Makhachkala (USSR). For primary bibliographic entry see Field 05A. W73-07312

ENVIRONMENTAL GEOCHEMISTRY HEALTH AND DISEASE, For primary bibliographic entry see Field 05B. W73-07346

PETROCHEMISTRY OF A PRECAMBRIAN IGNEOUS PROVINCE, ST. FRANCOIS MOUNTAINS, MISSOURI, Missouri Geological Survey and Water Resources, Rolla

Report of Investigations No. 51 (Contribution to Precambrian Geology No 4) 1972. 103 p 7 fig 3 tab

Descriptors: *Petrology, *Missouri, *Precambrian era, *Igneous rocks, Granites, Calcium, Iron, Magnesium, Silica, Silicates, Lime. Identifiers: *Petrochemistry, Intrusives, Extru-sives, Volcanics, Magma.

The exposed Precambrian rocks of southeastern Missouri are rhyolitic and associated andesitic extrusives, granites and granite porphyries of the St. Francois Mountains batholith, and a subordinate amount of diabase. The oldest exposed rocks are the extrusives. Dikes and sills of diabase intrude both volcanic and granitic intrusive rocks within the province. Analytical data for 65 igneous rocks were selected from 91 chemical analyses available

for the region, and were used to determine petrochemical relationships within the province. The Niggli values si, al, fm, c, and alk, calculated from selected analyses, indicate that both the extrusive and granitic intrusive rocks are derived from essentially acidic (si value), salic (al:fm ratio), subperalkalic (al:alk ratio), and c-poor (c value) magmas. Variation and QLM diagrams show that this igneous province is calc-alkalic with strong alkalic affinities in the high silica members: Magmatic differentiation is best illustrated in the granitic intrusive rocks that are characterized by progressive enrichment in silica and alkalies, and depletion in lime. (Campbell-NWWA) depletion in W73-07347

HYDROGEOLOGY OF LACUSTRINE SEDI-MENTS, BONNEVILLE SALT FLATS, UTAH, Texas Univ., Austin. For primary bibliographic entry see Field 02J. W73-07353

CHEMICAL QUALITY OF WATER IN CANO TIBURONES, PUERTO RICO: A RECONNAIS-SANCE STUDY CARRIED OUT IN 1967, Carological Surger of Bursts Dick Stat Union Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 07C. W73-07383

MOBILE WATER CONSERVATION LABORA-TORY, Gulf Research and Development Co., Pittsburgh, For primary bibliographic entry see Field 07B. W73-07394

SPECIFIC ION ELECTRODES AS TRANDU-CERS IN CONTINUOUS MONITORING APPLI-CATIONS, Orion Research, Inc., Cambridge, Mass. Div. of Technical Services.

In: Water Quality Instrumentation, Vol 1; Selected Papers from International Symposia presented by Instrument Society of America: Pittsburgh, Penn, Instrument Society of America, p 87-98, 1972. 5 fig. 15 ref.

Descriptors: "Water quality, "Water analysis,
"Monitoring, "Electrodes, "Instrumentation, Calcium, Chlorides, Electrochemistry, Ions,
Fluorides, Sodium, Sulfides, Aluminum, Sulfates.
Identifiers: "Specific ion electrodes.

Specific ion electrodes for calcium, chloride, fluoride, sodium, and sulfide can be used in both fresh water and saltwater, while electrodes for fluoroborate (for boron determinations), cyanide, nitrate, and total water hardness are limited to nitrate, and total water hardness are limited to fresh water, due to the effect of high salinity on electrode response. In addition, indirect electrode-based methods of analysis allow the determination of aluminum by reaction with fluoride, chlorine by reaction with iodide, and sulfate by reaction with lead. Laboratory techniques used to obtain precise concentration measurements using specific ion electrodes can be adapted to continuous monitoring systems. Temperature should be held constant, and, if possible, the use of a conventional reference electrode should be avoided. Ionic strength adjustment, interference elimination, and spiking techniques can be adapted to continuous monitoring by use of reagents and suitable placement of electrodes. (Knapp-USGS)

CHESAPEAKE RESEARCH CONSORTIUM INC. ANNUAL REPORT JUNE 1, 1971-MAY 31, 1972. For primary bibliographic entry see Field 02L. W73-07543

WATER RESOURCES DATA FOR TEXAS, 1970: PART 2. WATER QUALITY RECORDS. Geological Survey, Austin, Tex. For primary bibliographic entry see Field 07C. W73-07545

HIGH ACCURACY DETERMINATION OF CAL-CIUM IN BLOOD SERUM BY ISOTOPE DILU-TION MASS SPECTROMETRY, National Bureau of Standards, Washington, D.C. Inst. for Materials Research. For primary bibliographic entry see Field 07B. W73-07560

SIGNAL ENHANCEMENT IN REAL-TIME FOR HIGH-RESOLUTION MASS SPECTRA, Cornell Univ., Ithaca, N.Y. Dept. of Chemistry. F. W. McLafferty, J. A. Michnowicz, R. Venkataraghavan, P. Rogerson, and B. G. Analytical Chemistry, Vol 44, No 14, p 2282-2287, December 1972. 9 fig, 1 tab, 12 ref.

Descriptors: "Mass spectrometry, "Automation, "Computers, Methodology, Automatic control, Electronic equipment. Identifiers: "On-line systems, Signal enhancement, Mass spectra, Resolution, Sensitivity, "Description."

An on-line, real-time computerized method for effectively increasing the sensitivity, resolution, and mass measuring precision of a high-resolution mass spectrometer has been developed. This method for Signal Enhancement in Real Time (SERT) utilizes the relatively large vacant areas between peaks to rescan peaks in real-time under direct computer feedback control. The ensemble-averaged rescans have an increased signal/noise ratio when compared to the signal scans and significantly increase the effective sensitivity, resolution, and mass measuring precision of the instrununcanty increase the effective sensitivity, resoni-tion, and mass measuring precision of the instru-ment without increasing the scanning time, in con-trast to most methods for ensemble-averaging of spectral data. (Holoman-Battelle) W73-07562

DESIGN AND OPERATION OF TEMPERA-TURE-CONTROLLED MULTIPLE ELEMENT ELECTRODELESS DISCHARGE LAMPS FOR ATOMIC FLUORESCENCE SPECTROMETRY, FLUORESCENCE SPECTROMETR' Florida Univ., Gainesville. Dept. of Chemistry. For primary bibliographic entry see Field 07B. W73-07563

FLUOROMETRIC METHOD FOR DETERMINING NANOGRAM QUANTITIES OF NITRITE

ION, Sterling-Winthrop Research Inst., Rensselaer,

N.Y. L. J. Dombrowski, and E. J. Pratt. Analytical Chemistry, Vol 44, No 14, p 2268-2272, December 1972. 2 fig, 16 ref.

Descriptors: "Nitrites, "Ions, "Fluorometry, "Methodology, "Aqueous solutions, Chemical analysis, Chemical reactions, Pluorescence, Hydrogen ion concentration.

Identifiers: "p-chloroaniline, diaminopyridine, Precision, Sensitivity, Diazotization, Detection limits, Triazole, Fluorescent spectrum.

A sensitive fluorometric method has been developed for measuring the nitrite ion. The procedure involves diazotization of p-chloroaniline (PCA) and coupling with 2,6-diaminopyridine (DAP). The resulting azo product then is further derivatized with ammoniacal cupric sulfate to produce a highly fluorescent triazole compound (excit. max. 360 nm; fl. max. 430 nm). The intensity of the fluorescence is linearly dependent upon the nitrite concentration. The procedure permits detection of 2 nanograms nitrite ion per ml

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utilizing a 10-ml sample. The precision at this level is 7 percent. The triazole exhibits strong fluorescence in acid media and shows fluorescence quenching by hydroxide ion suggesting radiationless deactivation of the excited triazole inime anion. The coupling reaction between DAP and PCA was examined and found to be strongly pH dependent. Greatest reaction velocity was observed near neutral pH. The determined second-order rate constant at pH. S and termined second-order rate constant at pH. renouty was observed near neutral pH. The determined second-order rate constant at pH 5 and temperature of 22C was 85 plus or minus 5 liter mole/sec. Optimum conditions are presented for obtaining maximum nitrite detection sensitivity. (Holoman-Battelle) W73-07564

SPECTROPHOTOMETRIC DETERMINATION OF COBALT WITH 2,4,6-TRIS (2'-PYRIDYL)-

Texas Univ., Austin. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07565

ISOTOPE EXCITED X-RAY FLUORESCENCE, New York Univ., Medical Center, N.Y. T.J. Kneip, and G. R. Laurer. Analytical Chemistry, Vol 44, No 14, p 57A-58A, 60A-62A, 66A, 68A, December 1972. 6 fig, 9 ref.

Descriptors: *X-ray fluorescence, *Chemical anal-Descriptors: "X-ray fluorescence, "Chemical analysis, "Instrumentation, Chemical properties, Physical properties, Aqueous solutions, Laboratory equipment, Research equipment, Radioactivity, Efficiencies, X-ray analysis, Potassium, Chlorine, Iron, Copper, Zinc, Calcium, Alkaline earth metals, Magnesium, Sodium, Manganese, Bromine, Heavy metals, Alkali metals. Identifiers: "Isotope source, Detectors, Sample properties, Detection limits, Resolution, Biological samples, Multielemental analysis, Silicon, Germanium.

The continuing development of isotope excited applications of X-ray fluorescence analysis has been stimulated by (1) the ability to make a determination without time-consuming chemical manipulations in preparing a sample for analysis, and (2) instrument portability through the use of a radioisotopic source for excitation. This discussion is concerned with the interaction of careful. ion is concerned with the interaction of certain fundamental factors in isotope source X-ray fluorescence and their exploitation in describing three recently developed systems (central source system, annular source, concentric source-sample system) with capabilities exceeding those of cursystem) with capabilities exceeding those of currently available commercial equipment. The major parameters to be considered in the development of isotope source-X-ray fluorescence systems are the following: Chemical and physical properties of the sample; Isotopic source characteristics; Detector resolution and efficiency; and Source-sample-detector geometry. Possibilities for application of the new geometrical or concentric source-sample system to sub-ppm simultaneous multielement (K, Cl. Fe, Cu, Zn, Ca, Mg, Na, Mn, Ru, and Br) analysis of blood appear promising. (Holoman-Battelle) W73-07566

ON-LINE COMPUTER CONTROLLED MULTI-PLE ION DETECTION IN COMBINED GAS CHROMATOGRAPHY - MASS SPEC-Michigan State Univ., East Lansing. Dept. of Biochemistry. For primary bibliographic entry see Field 07C. W73-07570

ATOMIC ABSORPTION DETERMINATION OF NANOGRAM QUANTITIES OF TELLURIUM USING THE SAMPLING BOAT TECHNIQUE, Missouri Univ., Rolla. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07572

DETERMINATION OF SUR-NANOGRAM NACE ATOMIC ABSORPTION SP TROMETRY, Montana State Univ., Bozeman. For primary bibliographic entry see Field 05A. W73-07573 QUANTITIES OF SILVER IN SNOW BY FUR NACE ATOMIC ABSORPTION SPEC

MODIFICATION OF QUARTZ ABSORPTION TUBE FOR DELVES CUP-ATOMIC ABSORP-TION SPECTROPHOTOMETRY, New Jersey Coll. of Medicine and Dentistry,

M. M. Joselow.

Atomic Absorption Newsletter, Vol 11, No 6, p 131, November-December 1972, 1 fig. 2 tab. 2 ref.

Descriptors: *Laboratory equipment, Research

equipment.
Identifiers: *Delves cup method, *Atomic absorption spectrophotometry, *Quartz absorption tube.

Positioning the quartz absorption tube so that the entrance hole is exactly over the micro-crucible can be considerably aided by a simple modification of this tube, easily made with a file or grinding wheel. By making indentations at both ends of this tube so as to fit the attaching clips of the burner head tube supports, the absorption tube can be clipped or reclipped readily into a fixed position without need for further rotational adjustment. These grows can be made with any suitable file. These grooves can be made with any suitable file. It has been found that a small dental grinding wheel, attached to a dental drill or chucked into an electric hand drill, provided a quite satisfactory tool for forming properly sized grooves in the quartz tube. (Holoman-Battelle) W73-07596

THE USE OF AN ATOMIC ABSORPTION SPECTROPHOTOMETER FOR END-POINT DETERMINATION: APPLICATION TO CHLORIDE IN

MINATION.
WATERS,
Weyerhaeuser Co., Valliant, Okla.
J. W. Gambrell.
Atomic Absorption Newsletter, Vol 11, No 6, p

Descriptors: *Chlorides, *Water analysis, *Volumetric analysis, *Methodology, Pollutant identification, Ions, Waste water (Pollution), Chemical analysis.

absorption spec-letermination, Silver, trophotometry, *End-point determination, Silver, Precision, Recovery, Detection limits, Silver

The method of using an atomic absorption spec-trophotometer for the end-point determination of chloride with a silver nitrate titrant allows for the commonment for the end-point determination of chloride with a silver nitrate titrant allows for the assumption that no Ag ions are in solution until all the chloride has been precipitated. The Ag ion concentration, however, increases as further additions of the titrant are made. The linear relationship between the atomic absorbance and concentration of Ag is used in calculations the assimalsnip between the atomic absorbance and concentration of Ag is used in calculating the equivalence point which is then used to calculate chloride ion concentration. Synthetic and natural, treated, and waste water samples were analyzed for chloride by the following method. Two identical aliquots of the water sample are transferred to individual 100. waste water samples were analyzed for chloride by the following method. Two identical aliquots of the water sample are transferred to individual 100-ml volumetric flasks. Different increments of AgNO3 are added to each. The solutions are diluted, mixed, and filtered through very retentive filter paper. The absorbance due to Ag ion in each filtrate is determined by atomic absorption and the chloride concentration calculated using equations or by graphically determining the end-point and calculating the concentration. The same samples were spiked with standard chloride solution to calculating the concentration. The same samples were spiked with standard chloride solution to confirm recovery (92-108 percent). With this method (1) it should be possible to detect at least 0.5 ppm Cl using a 50-ml sample and 0.0141N Ag-NO3; (2) reliable chloride assays can be performed; and (3) the end-point is ascertained with

greater ease, particularly at the low chloride levels and in the presence of color and turbidity. (Holoman-Battelle) W73-07599

ACCESSORY 'GROOVED' TUBES FOR THE GRAPHITE FURNACE, Perkin-Elmer Corp., Norwalk, Conn. F. J. Fernandez.

Atomic Absorption Newsletter, Vol 11, No 6, p 123-124, November-December 1972. 3 fig.

Descriptors: *Performance, Instrumentation, Laboratory equipment, Temperature, Resitivity, Chemical analysis.

Identifiers: *Graphite furnace, *Grooved tubes, Tubes, Sensitivity, Biological samples, Blood,

Grooved graphite tubes have been shown to improve the performance of the Graphite Furnace for a number of special applications, particularly those using organic solvents. The new tube that has been designed has a shallow groove in the center of the inner tube surface. The grooved section is designed to contain the sample and prevent it from spreading along the tube. In addition, the wall thickness of the center section (0.7-mm) is larger than that of the outer sections (0.5-mm), resulting in a more even temperature distribution along the tube. With the grooved tube it is possible to utilize up to 50 microliter sample volumes of organic solvents with no loss of precision due to sample spreading. Preliminary experiments have shown that the more uniform temperature profile of the grooved tube provides more efficient charring of concentrated solutions such as whole blood and serum, as well as various types of solid samples. Additional differences between the standard and grooved tube such as different electrical resistance, attaining a different maximum temperature and poorer sensitivities make the standard tube preferable for general use with the Graphite Furnace. (Holoman-Battelle)

NEW METHOD OF DETECTION FOR THE COMPONENT OF LOW CONCENTRATION IN WATER BY DETECTOR TUBES, Yokohama National Univ. (Japan). School of En-

For primary bibliographic entry see Field 05A. W73-07616

AUTOMATIC GAP CONTROL UNIT FOR SPARK SOURCE MASS SPECTROMETRY, Virginia Univ., Charlottesville. Dept. of Chemis-

try.
C. W. Magee, and W. W. Harrison.
Analytical Chemistry, Vol 45, No 1, p 220-224,
January 1973. 6 fig, 8 ref.

Descriptors: *Automatic control, *Electrodes, *Electronic equipment, Laboratory equipment, Mass spectrometry.

Identifiers: *Spark source mass spectrometry, Precision, Accuracy, Automatic Gap Unit.

An Automatic Gap Unit (AGU) has been designed to automatically control electrode gap width on spark source mass spectrometers for the purpose of providing more accurate analyses. The unit monitors the RF voltage developed between the electrodes, which is proportional to gap width, and adjusts one of the electrodes in order to maintain the preset voltage between the electrodes. The unit has proved to be extremely useful for a broad range of sample types. A schematic of the unit is included. (Little-Battelle) W73-07620

LASER EXCITED ATOMIC AND IONIC FLUORESCENCE OF THE RARE EARTHS IN THE NITROUS OXIDE-ACETYLENE FLAME, Florida Univ., Gainesville. Dept. of Chemistry. N. Omenetto, N. N. Hatch, L. M. Fraser, and J. D. Wignfordies.

Analytical Chemistry, Vol 45, No 1, p 195-197, January 1973. 2 tab. 17 ref.

Descriptors: Aqueous solutions, Water analysis. Identifiers: "Atomic absorption spectrophotometry, "Rare earth elements, "Detection limits, "Atomic emission flame spectrometry, "Atomic fluorescence flame spectrometry, "Insic fluorescence flame spectrometry, "Lasers, Cerium, Erbium, Dysprosium, Europium, Gadolinium, Holmium, Lutetium, Neodymium, Praseodymium, Samarium, Terbium, Thulium, Ytterbium.

Detection limits are reported for rare earths in aqueous solutions analyzed by laser excited atomic and ionic fluorescence. Stock solutions of atomic and ionic fluorescence. Stock solutions of Ce, Dy, Er, Eu, Gd, Ho, Lu, Nd, Pr, Sm, Tb, Tm, and Yb were prepared from reagent grade chemicals. The laser beam was focused on the nitrous oxide-acetylene flame supported by a capillary burner and located 8 cm from the entrance skill of a circle reas reasochemeter, excited with 130 burner and located 8 cm from the entrance alit of a single-pass monochromator equipped with 1180 lines/mm grating and a photomultiplier. A boxcar integrator was the sampling detector. The atomic and ionic fluorescence transitions are listed, and detection limits are compared with those obtained by atomic absorption and flame emission in the nitrous oxide-acetylene flame. It appears that atomic emission spectrometry with the nitrous oxide-acetylene flame is preferable to atomic absorption or atomic fluorescence. However, in some cases atomic fluorescence will be adequate some cases atomic fluorescence will be adequated and simpler than other methods. (Little-Battelle) W73-07621

PHENOL BLUE AS A SOLVENT POLARITY IN-DICATOR FOR BINARY APROTIC SOLVENTS, Southwestern Coll., Winfield, Kans. Dept. of

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Chemistry.
O. W. Kolling, and J. L. Goodnight.
Analytical Chemistry, Vol 45, No 1, p 160-164,
January 1973. 5 fig, 4 tab, 21 ref.

Descriptors: *Absorption, *Polarity, Chromatog-

Descriptors: "Absorption, "Polarity, Unromatog-raphy, Identifiers: "Organic solvents, "Dielectric con-stant, "Refractive index, "Thin layer chromatog-raphy, "Phenol blue, Acetates, Acetonitrile, Benzene, Carbon tetrachloride, Chlorobenzene, Chloroform, Cyclohexane, Dichloromethane, Dimethyl sulfoxide, p-dioxane, Ethyl acetate, Nitromethane, Isooctane, Methanol, Petroleum ether, n-propanol, Isopropanol, Methyl ethyl ketone, Toluene, Acetic acid.

Solvent-induced shifts in the positions of electronic absorption bands for reference indicators have become the basis for empirical scales meahave become the basis for empirical scales measuring solvent polarity in one-component media. Recent investigations on Phenol Blue as a model solvatochromic dye have caused the generality of this approach to solvent polarity ranking to be doubted when applied to solvent mixtures containing hydrogen bonding donors and acceptors. Since binary solvents have widespread use in analytical methods requiring nonaqueous solvents, the present study was undertaken to examine solvatochromism in purely aprotic solvent pairs. The solvents investigated were acetone, acetonitrile, benzene, carbon tetrachloride, chlorobenzene, chloroform, cyclohexane dichloromethane, dimethyl sulfoxide, p-dioxane, ethyl acetae, nitromethane, isooctane, methanol, petroleum ether, n-propanol, and mixtures of benzene with butanol, benzene with isopropanol, benzene with butanol, benzene with isopropanol, benzene with butanol, benzene with isopropanol, benzene with chloroform, propanol, and acetone, methyl ethyl ketone with acetic acid and isopropanol and toluene with acetic acid. From a qualitative point of view, it is possible to distinguish two classes of aprotic binary solvents: those exhibiting a regular

change in polarity with changing solvent composi-tion; and those giving evidence of specific interac-tions. One- and two-parameter equations relating macroscopic properties of the solvent to the transition energy of Phenol Blue were tested with the two-component solvents. The McRae equation adequately predicts the general trend in transition energy over wide ethyl acetate mole fraction inter-vals in regular solvent systems. (Little-Battelle) W73-07622

ON THE SPECTROPHOTOMETRIC DETER-MINATION OF DISSOLVED SILICA IN NATU-RAL WATERS, Rhode Island Univ., Kingston. Graduate School of

Oceanography. K. A. Fanning, and M. E. Q. Pilson. Analytical Chemistry, Vol 45, No 1, p 136-140, January 1973. 5 fig, 3 tab, 27 ref.

Descriptors: *Spectrophotometry, *Sea water, *Silica, *Absorption, *Salinity, Water analysis, *Silica, *Abs Electrolytes.

Identifiers: Precision, Accuracy, Reagents, Molybdate.

The precision and accuracy of methods for the ination of dissolved silica in natural waters can be greatly improved by taking account of the time courses of some of the reactions involved. The kinetics of these reactions are dependent on the concentrations of electrolytes present in the samples. Based on results from a metol-sulfite reduction method, the molar absorptivity of a reduced mixture of the alpha- and beta-siomers of molybdosilicic acid in sea water is apparently af-fected only by the ionic strength but not by the nature of the component salts of the solution. (Little-W73-07623

SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF BARIUM AND STRON-TIUM USING SULFONAZO III,

Oregon State Univ., Corvallis. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07624

COMPUTER IDENTIFICATION OF MASS SPECTRA USING HIGHLY COMPRESSED SPECTRAL CODES, Jet Propulsion Lab., Pasadena, Calif.

For primary bibliographic entry see Field 07C. W73-07629

DUAL CHANNEL SYNCHRONOUS INTEGRA-TION MEASUREMENT SYSTEM FOR ATOMIC FLUORESCENCE SPECTROMETRY, Illinois Univ., Urbana. School of Chemical Sciences. For primary bibliographic entry see Field 07B.

W73-07630

POTENTIOMETRIC TITRATION OF SULFATE USING AN ION-SELECTIVE IRON ELECTRODE,

Texas Instruments Inc., Dallas. For primary bibliographic entry see Field 05A. W73-07634

A THEORY ON THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: III. EXACT SOLUTION FOR FIRST-ORDER KINETIC SORBTION, Oregon State Univ., Corvallis. For primary bibliographic entry see Field 02G.

MECHANISMS OF TRACE METAL TRANS-PORT IN RIVERS,
Northwestern Univ., Evanston, Ill. Dept. of
Geological Sciences.
For primary bibliographic entry see Field 05B.
W73-07671

SELECTED HYDROLOGIC DATA, LOWER BEAR RIVER DRAINAGE BASIN, BOX ELDER COUNTY, UTAH, Geological Survey, Salt Lake City, Utah. For primary bibliographic entry see Field 67C. W73-07679

2L. Estuaries

EFFECTS OF WATER DIVERSION ON ESTUARINE FAUNA IN THE MERRIMACK RIVER, MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 05C.
W73-07153

TECHNIQUE FOR EVALUATING SEDIMENTA-TION AT RIVER MOUTHS, Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 02J. W73-07161

PHYTOPLANKTON DYNAMICS IN THE DELAWARE RIVER ESTUARY, Millersville State Coll., Pa. For primary bibliographic entry see Field 05C. W73-07185

RIVER-OCEAN NUTRIENT RELATIONS IN Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C. For primar W73-07189

VARIABILITY OF SALINITY AND NUTRIENTS OFF THE COLUMBIA RIVER MOUTH, Washington Univ., Seattle. Dept. of Oceanography. For primary bibliographic entry see Field 05C. W73-07190

TOTAL PHOSPHORUS AND PHOSPHORUS-32 IN SEAWATER, INVERTEBRATES, AND ALGAE FROM NORTH HEAD, WASHINGTON, Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.

SEDIMENTATION IN THE INNER ESTUARY OF THE THAMES, AND ITS RELATION TO THE REGIONAL SUBSIDENCE, King's Coll., London (England). Dept. of Geology. J. E. Prentice.

Royal Society of London Philosophical Transac-tions, Mathematical and Physical Sciences, Vol 272, No 1221, P 115-119, May 4, 1972. 3 fig, 8 ref.

Descriptors: *Sedimentation, *Sediment transport, *Tidal effects, *Estuaries, Sediment distribution, Bottom sediments, Particle size, Suspended load, Sea level, Subsidence. Identifiers: *Thames River (England).

Studies of the sedimentation processes in the inner Thames estuary (England) suggest that the zone is a sediment trap in which the limits are set in the upstream direction by the salinity gradient, and in

Field 02-WATER CYCLE

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the downstream direction by the point at which loss of muddy sediment exceeds the supply. Within the estuary two zones are recognizable, an upper zone dominated by deposition from fluid mud, and a lower zone in which bed traction is the predominant agent. It is clear that the phases are highly mobile, and subject to seasonal shift. The effect of continued subsidence is likely to be the increase of salt-water penetration and the movement of the whole zone upstream. Any restriction of salt-water penetration by engineering works in the sea reach and its approaches will tend to move the zones downstream; any restriction of freshthe zones downstream; any restriction of freshwater flow will tend to condense the zones in an upstream direction. (Woodard-USGS)

SUBSIDENCE AND SEA-LEVEL RISE IN THE

THAMES ESTUARY, Polytechnic, London (England). Thames Estuary Research Group.

Research Group.

B. d'Olier.

Royal Society of London Philosophical Transactions, Mathematical and Physical Sciences, Vol 272, No 1221, p 121-130, May 4, 1972. 9 fig, 19 ref.

Descriptors: "Sedimentation, "Estuaries, "Tidal effects, "Water level fluctuations, Subsidence, Sea level, Sediment transport, Geomorphology, Erosion, Shores, Reviews, Evaluation. Identifiers: "Thames River (England).

The development of the area of the Thames Estuary (England) is briefly traced since the late Cretaceous period. The overall subsidence of the North Sea area, the 'Alpine' fold movements, and the transgression of the sea since the retreat of the Weichselian ice sheets have all contributed. The positions of the shoreline during the critical phase, 9600 B.P. to 8000 B.P., of this last transgression of the sea are shown. Subsequent to this main transgressive phase, crosion of the shoreline has been rapid due to storm waves and itidal current action. rapid due to storm waves and tidal current action. An estimation of the average rate of subsidence and/or sea-level rise is given based on the concept of sedimentary equilibrium in which a figure of 12.7 cm (5 in) per century is arrived. (Woodard-W73-07236

SEA-LEVEL OBSERVATIONS AND THEIR SECULAR VARIATION, Institute of Coastal Oceangraphy and Tides, Bir-

kenhead (England). J. R. Rossiter

Royal Society of London Philosophical Transactions, Mathematical and Physical Sciences, Vol 272, No 1221, p 131-139, May 4, 1972. 4 fig, 2 tab,

Descriptors: *Water level fluctuations, *Estua-ries, *Sea level, *Land subsidence, Tidal effects, Erosion, Sediment transport, Sedimentation, Hydrologic data, Equations. Identifiers: *Thames River (England).

The analysis of continuous sea-level records at coastal stations is direct and should be one of the most reliable means of assessing secular coastal movement in the vertical. However, limitations in movement in the vertical. However, limitations in the traditional techniques used to obtain raw data, and the existence of sea-level variations due to occanographic and meteorological phenomena require more than simple univariate regression analysis for best results. Some examples from situations in western Europe are given which have a bearing upon the subsidence of southeast England. Particular interest has been shown in the secular changes in the Thames Estaury Shermer. gand. Farticular interest has been shown in the secular changes in the Thames Estuary. Sheerness and Southend, the two major stations, are separated by only 4 km. Analyses of annual mean high and low water heights at Southend and Tilbu-ry for the years 1933-67 indicate trends in mean tide level of 3.4 and 2.9 mm/year respectively. All the evidence therefore points to a relative rise in

sea level in this region, over the past 50 years, of just over 3 mm/year, or 1 ft/century. (Woodard-USGS) W73-07237

THE TIDAL REGIME OF THE RIVER THAMES: LONG-TERM TRENDS AND THEIR POSSIBLE CAUSES, Institute of Coastal Oceanography and Tides, Bir-

kenhead (England).

kenhead (Engiano).

A. J. Bowen.

Royal Society of London Philosophical Transactions, Mathematical and Physical Sciences, Vol 272, No 1221, p 187-199, May 4, 1972. 7 fig, 4 tab,

Descriptors: "Tides, "Estuaries, "Water level fluc-tuations, "Sedimentation, "Tidal effects, Sea level, Sediment transport, Subsidence, Erosion, Geomorphology, Shores, Hydrologic data, Hydro-graphs, Reviews, Evaluation. Identifiers: "Thames River (England), Tidal

Some of the processes responsible for the ob-served changes in the tidal regime of the River Thames (England) are fairly well established, for example, the general sinking of southeastern En-gland. However, the reason for the relatively large gland. However, the reason for the relatively large increase in the mean tidal range in the upper estury is not obvious. Although definitive evidence is lacking, it seems probable that this increase is largely mammade and results primarily from the continual processes of embanking and bank raising. In 1799 the range of springs at London Bridge was only 15 feet; so that, in the last three-quarters of a century the increased oscillation is 5 feet 9 inches. century, the increased oscillation is 5 feet 9 inches.
Of the increased range of 4 feet 7 inches, 3 feet 10 inches are due to the elevation of the surface at high water, and 9 inches to the depression at low water. Information and data from expenditures water, and 9 inches to the depression at low water. Information and data from several sources are summarized. (Woodard-USGS) W73-07238

URBAN INFLUENCES UPON GROUNDWATER CCONDITIONS IN THAMES FLOOD PLAIN DEPOSITS OF CENTRAL LONDON, Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 04C.
W73-07239

COASTAL ZONE MANAGEMENT DELAWARE.

Available from NTIS, Springfield, Va PB-211 545 Price \$4.25 printed copy; 95 cents microfiche. Delaware Governor's Task Force on Marine and Coastal Affairs Report, February 18, 1971. 29 p.

Descriptors: "Water resources development, *Estuaries, "Water quality control, "Land development, "Delaware, Water management (Applied), Planning, Projections, Reviews, Evaluation, Water pollution control, Water users, Bays, Water utilization, Delaware River. Identifiers: Delaware Bay.

In 1970, Governor Russell W. Peterson of Delaware appointed a Task Force on Marine and Coastal Affairs to develop a master plan for coastal and bay areas. The approach the Task Force took was to define as its major objective the preparation of policy guidelines and certain key recommendations for the management and conduct of marine and coastal affairs for the State of Delaware. Such guidelines include the wise use of the water and land resources of the State's Coastal Zone for the economic and social benefits of its citizens. This plan describes actions by the State necessary to achieve a balance among the followcitizens. Inis plan describes actions by the State mecessary to achieve a balance among the follow-ing desirable goals: (1) Preserve and improve the quality of life and the quality of the marine and coastal environment for recreation, conservation

of natural resources, wildlife areas, aesthetics, and the health and social well being of the people; (2) promote the orderly growth of commerce, industry and employment in the coastal Zone of Delaware compatible with goal no. 1; and (3) increase the opportunities and facilities in Delaware for education, training, science and research in marine and coastal effects (Wood and 11950). for education, training, science and resear marine and coastal affairs. (Woodard-USGS) W73-07247

PATTERNS OF SEDIMENT TRANSPORT AT NEARSHORE ZONES INFLUENCED BY WAVE AND TIDAL CURRENTS: A STUDY UTILIZING FLUORESCENT TRACERS, Skidaway Inst. of Oceanography, Savannah, Ga. G. F. Oertel.

Georgia University System Marine Science Center Technical Report Series, No 72-7, November 1972. 28 p, 6 fig, 14 ref.

Descriptors: *Sediment transport, *Coasts, *Georgia, *Tracking techniques, *Environmental effects, Tidal effects, Currents (Water), Ocean waves, Geomorphology, Slopes, Sands, Deposition (Sediments), Tagging, Fluorescence,

In nearshore areas adjacent to Georgia estuary entrances, wave-current/tidal-current interactions are common, patterns of sand dispersion are very complicated, and the steep sides of bedforms are not always oriented normal to the direction of maximum current velocity or to the direction of longest duration of water flow. The relatively deep subtidal areas around shoal margins generally have relative wave heights (wave height/depth of water under wave crest) less than 0.2, and a timeunder wave crest) less than 0.2, and a time-velocity assymetry of wave surge is not common. In these areas, tidal currents are more important than waves in transporting sand, and sand is predominantly transported in linguoidal and cuspate dunes. The slip-face orientations of these dunes and the directions of the longest distances of sediment transport correspond to the directions of the tidal currents. The effects of several other combinations of tides currents waves and or the tual culents. Ine enterest is several unit combinations of tides, currents, waves, and bedforms upon sediment transport are described. (Woodard-USGS) W73-07251

DISTRIBUTIONAL TRENDS IN THE RECENT MARINE SEDIMENTS OF TUSIUJAQ COVE OF EKALUGAD FIORD, BAFFIN ISLAND, N. W.

McMaster Univ., Hamilton (Ontario). Dept. of

R. J. Knight.
Maritime Sediments, Vol 7, No 1, p 1-18, April,
Maritime Sediments, Vol 7, No 1, p 1-18, April,

Descriptors: *Bottom sediments, *Sediment transport, *Provenance, *Fjords, *Canada, Streamflow, Density stratification, Sedimentology, Particle size, Sediment sorting.

Identifiers: *Baffin Island (Canada).

Recent alluvial sediments were studied in Tasiujaq Cove, the bay at the head of Sarvalik Fiord, Baffin Island, Canada. The sediments of Tasiujaq Cove Issand, Canaua. The seaments of Issuinq Cove owe their origin primarily to fluvial agencies with subsequent dispersal brought about by means of marine currents and ice rafting and river slush-out mechanisms. Mean sizes decrease in the direction mechanisms. Mean sizes decrease in the direction of transport as the river inflow loses momentum. Within the study area, sandy gravels and gravelly sands are associated with the sandur, channel and beach deposits; marine samples are predominantly silty sands or sandy silts with some gravel. Anomalous sediment distributions are superimposed on hydraulically deposited sediments through ice rafting and river slush-out processes. All samples exhibit poor sorting which reflects the ineffectiveness of sorting processes within this environment. Intermittent streams, low energy beaches, and a combination of ice and water trans-

Estuaries—Group 2L

port agencies in a generally ice-covered marine environment are responsible for the poor sorting characteristics of the sediment. Strong stratification of the cove waters occurs during the summer runoff period due to the freshwater input into the saline cove waters. (Knapp-USGS) W73-07268

ON THE MORPHOLOGY OF THE NORTHEAST GULF OF ST. LAWRENCE, Canadian Hydrographic Service, Ottawa (Ontario).

Maritime Sediments, Vol 7, No 2, p 73-75, September, 1971. 1 fig, 9 ref.

Descriptors: *St. Lawrence River, *Topography, *Glaciation, *Geomorphology, Channel morphology, CBottom sediments. Identifiers: *Gulf of St. Lawrence.

The present Laurentian Channel and northeast Gulf of St. Lawrence originated as a major river valley system that became enlarged and greatly modified by glacier tongues. The major flow of ice was southeasterly through the Laurentian Channel, with additions from two major tributaries; one flowing southerly along Esquiman Channel and the other flowing easterly north of Ile d'Anticosti. South of Banc Beauge where Chenal d'Anticosti. South of Banc Beauge where Chenal d'Anticosti and Esquiman Channel pion, a long, low ridge extending southerly is bedrock with little till cover. Hence, it is likely that the ridge in question is largely a glacially sculptured bedrock spur that has also, because of its interlobate position, been the locus of ice-marginal deposition. A low ridge across the floor of the Laurentian Channel, south of the eastern tip of Ile d'Anticosti, could be the remmant of a recessional moraine. Eastward from Ile d'Anticosti there is a linear feature parallel to the strike of the Silurian and Ordivician rocks of the island. Leading into Chenal d'Anticosti from the north are a series of valleys cut into the Palaeozoic bedrock. These may represent tributaries to the ancient river system formed during a lower stand of sea level, that were locally enlarged, deranged and scoured by Pleistocene glaciation. (Knapp-USGS)

HEAT TRANSFER IN A GULF COST ESTUARINE LAKE, Louisiana State Univ., Baton Rouge. Reacting Fluids Lab. For primary bibliographic entry see Field 02H.

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mits GEOMORPHOLOGY AND SEDIMENTS OF THE CHESAPEAKE BAY ENTRANCE, Army Coastal Engineering Research Center, Washington, D.C. E. P. Meisburger,

Available from NTIS, Springfield, Va 22151 as AD-749 545 Price \$3.00 printed copy; \$0.95 microfiche. Technical Memorandum No 38, June 1972. 61 p, 16 fig, 32 ref, 3 append.

Descriptors: *Sedimentology, *Geomorphology, Chesapeake Bay, *Atlantic Ocean, *Inlets (Waterways), Sands, Shore protection, Artificial beaches, Sediments, Particle size, Surveys, Planning, Engineering, Data collections. Identifiers: *Chesapeake Bay entrance, Artificial nourishment.

Bottom morphology and sediments along the entrance of the Chesapeake Bay and the Atlantic Ocean in the vicinity of Cape Charles and Cape Henry were surveyed in an effort to locate suitable sand deposits in volumes great enough to economically restore and periodically nourish the shorre. Seismic reflection profiles and sediment cores were the basis for the study. Field and laboratory techniques used for the profiles and sediment ob-

tained from the sea floor in lower bay and ocean are presented. Most of the study area is less than 35 feet deep; distribution of shallow bay and inshore terraces and deeper water are shown. The study included analyses of borings taken along the route of the Chesapeake Bay Bridge Tunnel by the Bridge Commission in 1960 and 1961. Cores obtained for a dredging study by the Norfolk District, Corps of Engineers, 1970, were used in the study. Sand suitable for nourishment of ocean beaches within reasonable hauling distance of the Bay entrance occurs only in the coarse sand and gravelly sand exposure in Thimble Shoals Chansell, it is estimated that over 19 million cubic yards of this sand can be obtained either in exposure or under less than 5 feet of overburden. (Woodard-USGS)

COASTAL GEOMORPHOLOGY. For primary bibliographic entry see Field 02J. W73-07315

THE INVESTIGATION OF FORM AND PROCESSES IN THE COASTAL ZONE, South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst. For primary bibliographic entry see Field 02J. W73-07316

DYNAMICS OF BEACH ACCRETION IN SOUTH LINCOLNSHIRE, ENGLAND, Nottingham Univ. (England). Dept. of Geography. For primary bibliographic entry see Field 02J. W73-07319

SAND BARS ALONG LOW ENERGY BEACHES, PART 1, MULTIPLE PARALLEL SAND BARS OF SOUTHEASTERN CAPE COD BAY, Massachusetts Univ., Amherst. Coastal Research Center.

For primary bibliographic entry see Field 02J. W73-07320

PRELIMINARY EVALUATION OF INFILTRA-TION FROM THE MIAMA CANAL TO WELL FIELDS IN THE MIAMI SPRINGS-HIALEAH AREA, DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 04A. W73-07362

OCEANOGRAPHIC OBSERVATIONS IN MON-TEREY BAY, CALIFORNIA, FEBRUARY 1971 TO DECEMBER 1971, Moss Landig Marine Labs., Calif. For primary bibliographic entry see Field 07C. W73-07382

SUSPENDED SEDIMENT AND WATER CHARACTERISTICS,
Naval Oceanographic Office, Washington, D.C.
D.J. Ouellette.
Available from NTIS, Springfield, Va 22151 AD-

Available from NTIS, Springfield, Va 22151 AD-874 897 Price \$6.00 printed copy; 95 cents microfiche. Informal Report No 70-7, February 1970. 49 p, 6 fig, 11 plate, 18 ref.

Descriptors: *Sediment transport, *Estuaries, *Mississippi River, *Sedimentation, Data collections, Currents (Water), Tidal effects, Winds, Water temperature, Salinity, Runoff, Streamflow, Rainfall, Erosion, Sediment distribution, Sand bars, Gulf of Mexico, Turbidity currents.

Many variables affect the nature and amounts of suspended material carried by the Mississippi River distributary known as South Pass. Currents, tides, winds, temperature, salinity, and river stages all contribute to the eventual dissemination and settling of suspended matter discharged into the Gulf of Mexico. Of all the facets that influence the amounts of suspended material, stage of the river is most important. Field studies were conducted during a period of 2 to 3 days in June 1968, followed by the same number of working days in July, September, and October. There were 30 to 35 days between field trips. At any stage of the river the waters near the distributary mouth are normally in a turbid state. As the fresh water moves farther into the gulf, the amount of suspended material changes with local currents and tides. Because of settling of particles on and seaward of the bar, sediment in suspension becomes less as the fresh water progresses to the open sea. This action, along with bedioad movement, is the main cause of bar buildup toward the open sea. The presence of sediment, either from wave action and currents or from bottom transport over the bar, probably causes density increases sufficient to start a turbidity current flowing down the foreslope of the bar to deep water. (Woodard-USGS)

BENEFICIAL MODIFICATIONS OF THE MARINE ENVIRONMENT.

Proceedings of Symposium sponsored by National Research Council and Dept of the Interior, Washington, D. C. March 11, 1968: National Academy of Sciences, Washington, D. C., 1972. 116 p.

Descriptors: "Hydrology, "Oceans, "Great Lakes, "Water supply development, Conferences, Climatology, Sea ice, Water yield improvement, Almosphere, Moisture, Estuaries, Flow control, Tides, Salinity, Freshwater, Pollution abatement, Water transfer, Imported water, Water quality control, Reviews, Documentation.

Identifiers: "Marine hydrology, Environment modifications."

The Symposium on Beneficial Modifications of the Marine Environment, cosponsored by the National Research Council and Department of the Interior, was convened as part of the Research Council's Eleventh Annual Meeting, in Washington, D. C., March 10-12, 1968. This proceedings volume has been assembled from materials prepared by the Symposium's speakers and discussants, based on their presentations. The impetus for this Symposium came from the activities of the Federal Marine Council and the National Marine Commission, both of which were set up under the Marine Resources and Engineering Development Act of 1966. Emphasis was on the purely scientific and technical aspects of various plans that involve the modification of the marine environment and the Great Lakes, as is done in the Marine Resources Act. The papers include: Ice on the Ocean and World Climate; Atmospheric Moisture Extraction Over the Ocean; Water Transfers: Possible De-eutrophication of the Great Lakes; and Modification and Management of Water Flow in Estuaries. (See W73-07396 thru W73-07399) (Woodard-USGS)

ICE ON THE OCEAN AND WORLD CLIMATE, RAND Corp., Santa Monica, Calif.

In: Beneficial Modifications of the Marine Environment; Proceedings of Symposium sponsored by National Research Council and Dept of the Interior, Washington, D. C., March 11, 1968: National Academy of Sciences, Washington, D. C., p 4-65, 1972. 29 fig, 2 tab, 75 ref.

Descriptors: "Sea ice, "Climatology, "Ice cover, "Oceans, Heat budget, Atmosphere, Temperature, Heat transfer, Seasonal, Summer, Winter, Solar radiation, Snow cover, Reviews. Identifiers: "World climate, Ice effects.

Field 02-WATER CYCLE

Group 2L—Estuaries

About 10% of the ocean area in the Northern Hemisphere is covered by floating ice in winter; in the Southern Hemisphere, over a larger ocean area, the figure is about 13%. The extent of this pack ice varies greatly during the year and from year to year. It has long been observed that these variations show a close correlation with many invariations show a close correlation with many in-dices of climatic change. As the arctic ice pack recedes, storm tracks tend to go farther north, and midlatitude rainfall patterns tend to shift eastward. This paper attempts to explain why the variable extent of ice on the sea is a very sensitive climatic lever that can amplify the effects of small changes in global heating. The prospect for influencing these processes is also discussed. To understand fully why the presence or absence of ice cover has such an enormous effect on the heat budget of the atmosphere, one must look closely at the behavior atmosphere, one must look closely at the benavior of all the heat-budget components; but in the simplest terms, the presence of an ice cover effectively prevents heat exchange between the ocean and the atmosphere, both in winter and in summer. (See also W73-07395) (Woodard-USGS)

ATMOSPHERIC MOISTURE EXTRACTION OVER THE OCEAN,

Lamont-Doherty Geological Observatory, Palisades, N.Y.

R. D. Gerard, and J. L. Worzel.
In: Beneficial Modifications of the Marine En-

ament; Proceedings of Symposium spo by National Research Council and Dept of the In-terior, Washington, D. C., March 11, 1968: Na-tional Academy of Sciences, Washington, D. C., p 66-84, 1972. 7 fig., 1 tab., 26 ref.

Descriptors: *Water yield improvement, *Water supply, *Water harvesting, Metholodogy, Condensation, Atmosphere, Moisture, Oceans, Winds, Colling, Temperature, Equipment, Coasts, Identifiers: *Atmospheric moisture extraction.

Major efforts and substantial gains have been made in the conversion of waste water and in the desalination of seawater. These efforts all too often take the form of a struggle to overcome the natural environment rather than an effort to use the natural conditions to advantage. Some of the newest large-scale water-conversion systems are now planned as dual-purpose electric power and desalination plants, based on atomic energy. Unfortunately, many of these advances are accompanied by the creation of new problems affecting the environment, such as thermal or brine pollu-tion, atmospheric pollution, and radioactive conation. A water-recovery scheme is discussed that takes optimum advantage of natural environ-mental conditions. The scheme involves the condensing of atmospheric moisture by the use of cold offshore seawater. In this scheme, the deep offshore seawater used as a cold source is brought up through a large-diameter pipe and pumped through a condenser array located on shore so as to intercept the flow of the moisture-saturated winds. When cooled, this air condenses much of its moisture, which is then carried away and stored for use as potable water. (See also W73-07395) (Woodard-USGS) W73-07397

WATER TRANSFERS: POSSIBLE DE-EUTROPHICATION OF THE GREAT LAKES, ois State Water Survey, Urbana W. C. Ackermann.

In: Beneficial Modifications of the Marine Enby National Research Council and Dept of the In-terior, Washington, D. C., March 11, 1968: Na-tional Academy of Sciences, Washington, D. C., p 85-103, 1972. 12 ref.

Descriptors: *Pollution abatement, *Great Lakes, Water transfer, *Imported water, Reviews

Methodology, Eutrophication, Nutrients, Water treatment, Inter-basin transfers, Water quality control, Water pollution control.

This review defines and describes the principal physical features of the Great Lakes system and the eutrophication process. A number of water-transfer schemes are discussed that have been proposed or that might be worth consideration. The most ambitious water scheme was proposed in 1963 by the Ralph M. Parsons Company, and was called the North American Water and Power Alliance (NAWAPA). This plan would collect water from Alaska and northwestern Canada and distribute it to the Canadian prairies, the United States, and northern Mexico. The total drainage area involved in the collection area is 1.3 million sq mi, with an average annual runoff of 663 million acre-ft. Of this, about 110 million acre-ft, or less than 20%, would be withdrawn. NAWAPA would than 20%, would be withdrawn. NAWAPA would train 20%, would be withdrawn. NAWAFA would provide for both increased irrigation and electrical power generation. A navigable waterway could be constructed, linking Vancouver on the Pacific Ocean with Lake Superior, and providing irriga-tion along the way in Canada. The canal would ultimately deliver 48 million acre-ft of water to the Great Lakes system. The cost of the project is estimated at \$100 billion over the approximately 30 years required for completion. (See also W73-07395) (Woodard-USGS)

MODIFICATION AND MANAGEMENT OF WATER FLOW IN ESTUARIES, Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst. D. W. Pritchard.

In: Beneficial Modifications of the Marine Enby National Research Council and Dept of the In-terior, Washington, D. C., March 11, 1968: Na-tional Academy of Sciences, Washington, D. C., p 104-116, 1972. 2 fig, 4 ref.

Descriptors: *Estuaries, *Flow characteristics, Pescriptors: "Folkmens," row Characteristics,
"Tidal effects, "Saline water intrusion, "Flow control, Methodology, Reviews, Engineering structures, Flow augmentation, Water control, Water
quality control, Salinity, Freshwater.

The most obvious parameter to control in the modification of water flow in estuaries is the freshwater inflow. The freshwater inflow to most coastal-plain estuaries along the East Coast of the United States exhibits very large seasonal and year-to-year variations. These flows produce seasonal variations in both the salinity distributions. and the associated circulation patterns in the estuaries. Control of the river discharge through upstream storage impoundments would obsiously decrease the seasonal variation of both the salinity and the circulation patterns. Suppose sufficient upstream storage could be provided that the river discharge to the estuary could be maintained at some nearly constant value. The upstream intru-sion of sea-derived salt would then be stabilized, and, except for the tidal variations, salinity at any point in the estuary would be maintained at a nearly constant value. The volume rate of seaward flow in the upper portion of any cross section, and of the landward flow in the deeper portion of that section, would remain approximately constant, and hence the flushing rate of the estuary would and neares the littering rate of the estuary would not be subject to seasonal fluctuations. Several other methods of water flow modification are reviewed. (See also W73-07395) (Woodard-USGS)

STABLE ISOTOPE TRACING OF COASTAL SAND TRANSPORT USING DYSPROSIUM OX-

IDE, Old Dominion Univ., Norfolk, Va. Inst. of Oceanography, C. G. Boone, and J. F. Slowey.

Available from NTIS, Springfield, Va 22151 as AD-743 998 Price \$3.00 printed copy; 95 cents microfiche. Technical Report No 3, January 31, 1972. 56 p, 19 fig, 5 tab, 34 ref. Contract DACW72-71-C-0008.

Descriptors: *Sediment transport, *Sands, *Coasts, *Tracking techniques, *Neutron activation analysis, Tagging, Oxides, Stable isotopes, Analytical techniques, Laboratory tests, On-site Identifiers: *Sediment tagging, Rare earth

A sediment transport study utilizing sand grains coated with stable isotopes of the rare-earth group as tracers was conducted. A field test was conducted at Camp Pendleton, Virginia. Samples were collected and subjected to neutron activation analysis to determine the pattern of sediment movement in the littoral zone. Separate tests with samarium and lanthanum oxides indicated that no more than about 5% of the rare-earth oxide coating was lost from the sand grains through the combined effects of leaching and abrasion. The dispersal patterns obtained after 1 and 4 hours indicate that rare-earth labeled sedimentary particles can be followed after injection and dilution in the field. A mean particle drift rate of 0.42 ft/min was determined from the dispersal patterns. (Woodard-mined from the dispersal patterns. (Woodardnined from the dispersal patterns. (Woodard-USGS)

DELTAIC ACTIVITY OF BHAGIRATHI-HOOGHLY RIVER SYSTEM, Calcutta Port Commissioners, (India). Hydraulic

Study Dept. S. K. Bhattacharya.

Journal of Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 99, No WW1, Paper 9538, p 69-87, February 1973. 14 fig. 3 tab, 14 ref.

Descriptors: *Silting, *Deltas, *Sedimentation, *Saline water intrusion, Regime, Sediment trans-port, Deposition (Sediments), River flow, Tides, Tidal effects. Identifiers: *Ganges delta (India).

The Bhagirathi-Hooghly river system, in the Indoone binagiratin-Hooginy river system, in the indo-cangetic delta, is in a state of progressive siltation. Geological evidence confirms the gradual shift in the river course of the Ganga, resulting in reduc-tion in both quantity and duration of the upland discharge in the Bhagirathi-Hooghly. Due to the imbalance created between the tides and the imonance created between the unes and the upland discharge, this major river system in the delta in the West Bengal State, India, is fast silting up. Salinity is progressing inland. (Knapp-USGS) W73-07405

COMPUTATION OF THE SALINITY AND TEM-PERATURE FIELDS IN THE SEA NEAR A RIVER MOUTH, Akademiya Nauk SSSR, Moscow. Institut Oke-

anologii.
V. L. Vulis, and Yu. V. Masolov.
Oceanology, Vol 12, No 1, p 133-136, 1972. 3 fig, 6
ref. Translated from Okeanologiya (USSR), Vol

Descriptors: *Oceanography, *Estuaries, *Sea water, *Salinity, *Water temperature, Currents (water), Jets, Diffusion, Analytical techniques, Identifiers: *USSR, Neva River.

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A DI TI NO CI PO

Investigation of the distributions of salinity and temperature near the mouth of the Neva River was based on the theory of a plane turbulent source jet. The distributions of salt concentration and temperature along the axis of a current were computed by the similarity theory for the current, and results were compared with experimental data. (Josefson-

DEEP TURBIDITY LAYER IN THE GOTLAND

BASIN, Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii. V. V. Yakubovich, O. S. Pustel'nikov, and G. S.

Karabashev. Oceanology, Vol 12, No 1, p 78-83, 1972. 4 fig, 1 tab, 13 ref. Translated from Okeanologiya (USSR), Vol 12, No 1, 1972.

Descriptors: *Oceanography, *Water properties, *Turbidity, Water temperature, Salinity, Hydrogen ion concentration, Suspension, Suspended solids, Suspended load, Sediments, Currents (water), Turbulence, Instrumentation, Measurement, Surveys, Analytical techniques. Identifiers: *USSR, *Gotland Island, Suspended

Spatial distribution of transparency in the Gotland Basin and quantitative and qualitative composition of suspended matter, temperature, salinity, and pH were investigated in a detailed survey conducted by the 15th Baltic Expedition of the Soviet research vessel Professor Dobrynin in June 1970. Transparency was observed to decrease with increasing concentration of suspended matter at depths from 140-160 m to the bottom. The turbidity layer was both vertically and horizontally inhomogeneous and contained more mineral particles than the overlying water. The presence of the turbidity layer can be attributed to turbulent curents throughout the water column of the basin. rents throughout the water column of the basin.
(Josefson-USGS) W73-07410

CHESAPEAKE RESEARCH CONSORTIUM INC. ANNUAL REPORT JUNE 1, 1971-MAY 31, 1972.

1972, 754 p.

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Descriptors: "Chesapeake Bay, "Hydrology, "Water quality, "Hydrologic data, Projects, Institutions, Economics, Social aspects, Ecology, Ecosystems, Chemical analysis, Water Chemistry, Salinity, Geomorphology, Tidal effects, Sediment transport, Biological properties, Water pollution sources, Waste water (Pollution), Reviews. Identifiers: Annual report.

The Chesapeake Research Consortium was chartered as a nonprofit corporation in the State of Maryland in January 1972, following approval by the participating organizations: Regents and Trustees of the Johns Hopkins University, University of Maryland, Smithsonian Institution, and Virginian Institute of Marine Science. The mission of the organization is to conduct an integrated and collaborative research program which will contribute to better management of the Chesapeake Bay. This first annual report of CRC presents the research programs carried forward apeake Bay. This first annual report of CRC presents the research programs carried forward during the period June 1, 1971 to May 31, 1972. Brief coverage of CRC organization and management is followed by discussion of general research strategy and development of an information system, and by description of the publishing program. These topics are followed by sections on biological, physical-chemical, and socioeconomic studies. Emphasis is directed toward four biological areas: biological distributions, productivity and food webs, the effects of environmental perturbations on the Bay, and improved rearing techniques for important economic species. (Woodard-USGS) W73-07543

A SIMPLIFIED METHOD OF PREDICTING DISSOLVED OXYGEN DISTRIBUTION IN PARTIALLY-STRATIFIED ESTUARIES, Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W73-07582

ENVIRONMENTAL CONSIDERATIONS FOR ESTUARINE BENTHAL SYSTEMS, Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C. W73-07615

NILE DELTA: THE DEFUNCT PELUSIAC BRANCH IDENTIFIED, Geological Survey of Israel, Jerusalem.

A. Sneh, and T. Weissbrod. ce, Vol 180, No 4081, p 59-61, April 6, 1973. 2 fig, 14 ref.

Descriptors: *Deltas, *Channel morphology, *Degradation (Stream), *Distribution patterns, Social impact, Silting, Deposition (Sediments), Beaches, History, Radioactive dating, Flood Identifiers: *Nile Delta, Egypt, Pelusiac Branch.

Seven major deltaic branches of the Nile River are Seven major deltaic branches of the Nile River are recorded in historical documents including ancient maps. Five branches degenerated and have silted up in the course of history. The course of the ancient Pelusiac branch of the Nile River has been traced on a deltaic plain east of the Suez Canal, between the El Bagar Canal and Tell el Farama (ancient Pelusium). Two minor distributaries branched northward. The critical stage in the process of the silting up of the lower reaches of the Pelusiac branch, due to prograding beach accretion, occurred around A.D. 25. Ancient ruins in the area are closely associated with the courses. area are closely associated with the courses (Lang-USGS) W73-07673

SALT WATER INTRUSION IN THE SUMMER-

*Saline water intrusion. "Hydrogeology, "Artesian aquifers, Canada, Car-bonate rocks, Confined water, Diffusion, Aquifer testing, Drawdown, Withdrawal, Permeability, Path of pollutants, Encroachment, Transmissivity. Identifiers: Prince Edward Island (Canada).

Saltwater intrusion is an acute problem in the coastal areas of Prince Edward Island. In the town of Summerside, groundwater supplies are developed from an aquifer hydraulically connected with the sea. Over the past ten years, there has been progressive contamination of the aquifer, particularly in wells close to the seashore. Test drilling, aquifer testing and chemical studies were undertaken in Summerside to study the nature and extent of the saliwater intrusion. Landward encroachment of the saliwater intrusion. Landward encroachments of the saliwater intrusion. Candward encroachment of the saliwater intrusion. Salivater concording to the salivater of the salivater of the salivater of the salivater of the salivater of the salivater of salivater considerous sandstone which is a semiconfined saulifer. Two separate zones of salivater concontierous sandstone which is a semicontined aquifer. Two separate zones of saltwater contamination are an upper zone from a depth of 0 to 80 feet caused by a landward hydraulic gradient of the fresh water due to heavy pumping and a second zone at a depth of 350 to 400 feet caused by intermitted annuals. intermittent pumping resulting in a raising and thickening of the zone of diffusion. (Knapp-USGS) W73-07677

REGULATION OF LONGSHORE SEDIMENT TRANSPORT (REGULIROVANIYE VDOL'-BEREGOVOGO POTOKA NANOSOV), Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.

B. A. Pyshkin, Ye. S. Tsaytts, and Yu. N.

Sokol'nikov. Izdatel'stvo 'Naukova Dumka', Kiev, 1972. 136 p.

Descriptors: "Littoral drift, "Sediment transport, "Sediment control, "Regulation, "Shore protec-tion, Shores, Coastal engineering, Coastal struc-tures, Jettles, Dikes, Groins (Structures), Har-bors, Reservoirs, Silting, Deposition (Sediments), Sediment discharge, Currents (Water), Waves (Water), Model studies, Equations. Identifiers: "USSR, Longshore currents.

Development of methods for regulating longshore movement of sediments for protection of coastal structures from silt accumulation was based on theoretical, experimental, and large-scale investigations carried out in 1965-70 by the Institute of Hydromechanics, Ukrainian Academy of Sciences. The methods of sediment control described are evaluated to determine their feasibility, effectiveness, and cost. (Josefson-USGS) W73-07681

COASTAL ZONE MANAGEMENT. For primary bibliographic entry see Field 06E. W73-07699

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 3, WESTPORT SMALL-BOAT BASIN STUDY; HYDRAULIC MODEL INVESTIGA-

TION, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08B. W73-07730

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 2, NORTH JETTY STUDY; HYDRAU-LIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08B. W73-07731

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 4, SOUTH JETTY STUDY; HYDRAU-LIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08B. W73-07732

MARINE RADIOECOLOGY, A SELECTED BIBLIOGRAPHY ON NON-RUSSIAN LITERA-

Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 05B. W73-07769

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DEVELOPMENT OF IMPROVED CELLULOSE ACETATE MEMBRANES FOR REVERSE OS-

MOSIS, Hercules, Inc., Cumberland, Md. Allegany Bal-

listics Lab.

M. B. Harbert, M. E. Cohen, M. A. Grable, J. W.
Morton, and B. M. Riggleman.

For sale by the Superintendent of Documents, U.
S. Government Printing Office, Washington, D. C.
20402 Price \$0.50. Office of Saline Water Research
and Development Progress Report No 745,
February 1972. 36 p., 11 tab, 8 fig, 3 ref. OSW Contract 14-30-2527.

Descriptors: *Desalination, *Reverse Osmosis, *Membrane Processes, *Sea Water, *Semi-Permeable Membranes.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

Identifiers: *Hollow Fibers, *Composite Hollow Fibers *Asymmetric Membranes, *Dense Mem-branes, Cellulose Acetate, Cellulose Triacetate.

The objective was to develop improved cellulose acetate hollow-fiber membranes for reverse osmosis desalination. Two types of hollow-fiber membranes were investigated - asymmetric and composite. Asymmetric membranes were prepared by forming a dense selective surface layer on a porous gelled substructure of cellulose diacetate or cellulose triacetate. Composite membranes were formed by coating a porous nonselective substrate with an ultra-thin selective film. Cellulose acetate (CA) hollow-fiber membranes were prepared from cellulose acetate thermal gels by spinning into a water bath and then annealing the fibers in a dilute solvent mixture. The temperature prepared from centures accessed to the property of the fibers in a dilute solvent mixture. The temperature and duration of the annealing process were varied to yield hollow-fiber membranes with an initial flux rate of 6 gfd and 95% sodium chloride rejection to 8.5 gfd and 75% rejection at 600 psi. Magnesium sulfate rejection was 95% at 9.5 gfd. The membranes were found to be more suitable for brackish water treatment at 200-400 psi than for higher pressure operation. Studies were conducted which demonstrated the feasibility of preparing a composite hollow-fiber membrane. Membranes suitable for desalination of brackish waters were developed. However, preparation of a composite developed. However, preparation of a composite hollow-fiber membrane suitable for sea water ap-plications will depend upon the development of a substrate which can withstand the higher pressures required. (OSW) W73-07227

SALINE WATER CONVERSION REPORT, 1970-

-1971. Office of Saline Water, Washington, D.C.

Available from GPO, Washington, D.C. 20402 Price-50 cents. Report, 1971. 32 p, 4 fig, 15 photo.

Descriptors: *Desalination, *Desalination processes, *Desalination plants, *Desalination paparatus, *Water supply, Reviews, Evaluation, Methodology, Costs, Water quality, Water demand, Engineering, Distillation, Membrane processes, Electrodialysis, Flash freezing, Water chemistry, Research and development. Identifiers: *Saline water conversion. *Desalination,

Two activities concerned with saline water conversion were emphasized during 1970-determining costs of desalting for water supply and determining future needs and impact desalting will have on future U.S. water requirements. Desalting costs on ruture U.S. water requirements. Desalting costs include those that are current, projected, and comparisions by processes and combinations. There are a number of U.S. leasting. on future U.S. water requirements. Desalting costs include those that are current, projected, and comparisions by processes and combinations. There are a number of U.S. locations now, such as in the Virgin Islands, Florida, Texas, South Dakota, and Arizona, where desalting for municipal supply is in regular use. Within 10 years it is anticipated that municipal and industrial usage, both of brackish and seawater, will significantly increase as desalting costs decline and as needs to improve water quality increase. The greatest potentials are in the brackish water inland areas, the Southwest Pacific area and the Gulf Coast area. Within 30 years larger applications can be anticipated for municipal or regional supply of significant size in the Southwest Pacific area, particularly Southern California, and possibly the Gulf Coast and Northeast United States. During 1970, cooperative studies were underway with the following states: California, Colorado, Montana, New Mexico, Pennsylvania and Texas. (Woodard-USGS) W73-07230

SALINE WATER CONVERSION SUMMARY REPORT, 1971-1972. Office of Saline Water, Washington, D.C.

Available from GPO, Washington, D C 20402 Price \$1.00. 1972. 77 p, 3 fig, 24 photo, 3 tab, 4 ap-

Descriptors: "Desalination, "Desalination processes, "Desalination plants, "Desalination apparatus, Evaluation, Reviews, Methodology, Costs, Water supply, Water demand, Water quality, Engineering, Distillation, Electrodialysis, Membrane processes, Flash freezing, Research and development, Water chemistry. Identifiers: "Saline water conversion.

In 1952, when the Office of Saline Water (OSW) was established, the costs for desalting seawater in a few land-based plants ranged upward from \$7 per 1,000 gallons. Now, 1972, seawater distillation plants of 1 to 10 million gallons per day are producing fresh water for costs ranging from 75 cents to \$1.25 per 1,000 gallons. These cost figures relate to the distillation of seawaters which are high in salinity. When lower salinity water (called brackish) are treated with membrane processes, the cost is considerably lower. The membrane processes, which were either laboratory curiosities or unknown in 1952, can desalt brackish water in plants of up to several million gpd in a cost range of 30 to 50 cents per 1,000 gallons. From these cost comparisons of actual production, desalting is commercially available for municipal and industrial use in plants up to 10 million gpd. Progress reports of other activities are summarized. (Woodard-USGS) W73-07231

INDEXED BIBLIOGRAPHY OF NUCLEAR DESALINATION LITERATURE-7,
Oak Ridge National Lab., Tenn. Nuclear Desalination Information Center.

K. O. Johnsson. A-vailable from NTIS, Springfield, Va 22151 ORNL-NDIC-13 Price \$3.00 printed copy; \$0.95 microfiche. Report ORNL-NDIC-13, September 1972. 64 p. Contract W-7405-ENG-26.

Descriptors: "Desalination, "Bibliographies, "Abstracts, "Publications, "Nuclear powerplants, Desalination plants, Facilities, Methodology, Indexing, Information retrieval, Documentation.

Abstracts are given for approximately 200 published articles related to the desalination of sea published articles related to the desaination of sea water. The body of the report is a copy of informa-tion stored in a computerized storage and retrieval system for the Nuclear Desalination Information Center (NDIC) at the Oak Ridge National Laboratory. The abstracts are grouped in ten categories (and repeated if they fall into more than one category). An author index and a keyword index are provided. The keywords, which identify the content of the articles, were chosen from a thesaurus developed by NDIC. (Woodard-USGS) W73-07273

TITLE-AUTHOR-COMPANY INDEX TO RE-PORTS PUBLISHED BY THE U.S. DEPART-MENT OF THE INTERIOR OFFICE OF SALINE WATER, THROUGH JULY 1972, Oak Ridge National Lab., Tenn. Nuclear Desalina-tion Information Center. K. O. Johnsson.

A. O. Johnsson. Available from NTIS, Springfield, Va 22151 as ORNL-NDIC-11 (Rev 1) Price \$3.00 printed copy; \$0.95 microfiche. Report ORNL-NDIC-11 (Rev), October 1972. 104 p. Contract No W-7405-ENG-

Descriptors: *Saline water, *Projects, *Research and development, *Bibliographies, *Information retrieval, Indexing, Documentation, Publications, Desalination, Brine disposal, Methodology, Facili-

Identifiers: *Office of Saline Water.

This permuted index includes titles, authors, com-This permitted index includes titles, authors, com-panies, and numbers of the approximately 800 research and development progress reports issued by the Office of Saline Water, U.S. Department of the Interior, through July 1972. The index was prepared with the aid of a computer and is presented in computer printout form. (Woodard-USGS)

HYGIENIC EVALUATION OF THE MINERAL COMPOSITION OF DRINKING WATER OB-TAINED BY PARTIAL DESALINATION, Institute of General and Municipal Hygiene, Moscow (USSR).

Moscow (USSR).

7. A. Nikolaeva, A. I. Bokina, Yu. A.
Rakhamanin, V. P. Plugin, and T. S. Khachatryan.
Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 152-156, October-December, 1970. 2 fig, 1 tab, 13 ref. Trans from Gigiena i Sanitariya.

Descriptors: *Water quality, *Desalination, *Boron, *Bromine, Organoleptic properties, Odor, Reverse osmosis, Water treatment, Seawater, Potable water, Water supply, Electrodialysis, Chloride, Membranes, Public health.

A model electrodialysis desalinating unit was tested on board ship. Although the unit reduced the concentration of chloride ion to a hygienically permissible level, the desalinated water contained up to 4.5 mg boron/1 and 1.5 to 1.8 mg bromine/1. Studies of the effects of boron and bromine on the organoleptic properties of water showed that both elements affect the taste of water more strongly than its odor. The results of short term experiments indicated that boron was considerably more toxic than bromine which was moderately toxic. results from these experiments indica need for additional processing of the water or design of boron and bromine retaining membranes to insure the necessary reduction of the concentrations of these elements in the processed water. (Smith-Texas) W73_07285

CASE STUDIES OF DESALTED WATER FOR IRRIGATION,
Bureau of Reclamation, Denver, Colo.
E. S. Krous, J. T. Maletic, H. L. Parkinson, and C.

B. S. Krous, J. I. Maieuce, H. L. Parkinson, and c. van Hoek.
Available from Superintendent of Documents, U.S. Gov't Printing Office, Wash., DC. Office of Saline Water Research and Development Progress Report No 785, March 1972. 267 p. 44 fig, 88 tab, 83 ref. OSW Contract 14-01-0001-1241.

Descriptors: *Desalination, Irrigation water, *Cost-benefit analysis, Irrigation efficiency, Brine disposal, *Arizona, *California, *Water utiliza-tion, Cost analysis. Identifiers: *Agricultural water utilization, Coachella (Calif), South Gila (Ariz), Buckeye

(Ariz).

Three irrigated areas in Arizona and Californi were studied to measure water costs and benefits associated with using water desalted to concentrations of 50, 200, 400, 900, and 1,500 ppm. Desalting plant sizes were matched to areas having sufficient historic data and environmental conditions to allow for the application of a case study approach.

Costs analyses were made for four desalting methods - multistage flash distillation, vertical tube evaporator/multistage flash distillation, electrodialysis, and reverse osmosis for nuclear and nonnuclear sources of energy. Design capacities ranged from 2.2 to 85.7 mgd. Feed water quality for desalting ranges from an average of 2,280 to 5,330 ppm. The three study areas contain 10,566 5,330 ppm. The three study areas contain 10,366 (Couchella), and 1,433 (Buckeye) irrigable acres. Water sources include saline wells and irrigation drainage effluent. High value crops were used in the benefit studies to illustrate a maximum production potential. Crop en-terprise budgets were used to develop direct, in-direct, and public benefits at each water quality level. Costs shown include costs for desalting, seves. Costs snown include costs for desalting, boron removal, water storage, brine disposal, gyp-sum treatment, pumps and pipelines, and water distribution. (OSW) W73-07334

HISTORY OF DESALTING OPERATION, MAINTENANCE, AND COST EXPERIENCE, S. L. Scheffer.
Journal of the American Water Works Association, Vol 64, No 11, p 726-734, November 1972. 3 fig, 11 tab, 7 ref.

Descriptors: "Desalination, "Operating costs, "Operation and maintenance, "Maintenance, Maintenance costs, "Electrodyalisis, "Reclaimed water, "Membrane processes, Cost analysis, Saline water, Desalination plants, History, Performance, Brine disposal, Costs, Cost allocation, "Arizona, Arid lands, Engineering structures, Water treatment, Ion exchange, Cost comparisons."

pansons.

Early in 1971, the Office of Saline Water sponsored a study with the American Water Works Association Research Foundation to review the impact of desalting technology on community water supplies. Operating experiences at various desalting plants in the U.S. provided background, and an investigation of the experiences with the Buckeye, Arizona electrodialysis plant was made as part of this program. The 650,000-gpd electrodialysis elealting plant in Buckeye started operation on September 9, 1962. Historical background, information on costs and performence (including information about feedwater supply, electrodialysis equipment, brine disposal, and product-water transmission), data on water rates, and revenues for the years 1963-1970 are presented. An 8-year summary shows average water costs along with average annual billings to consumers. Cost estimate of product water is determined at 90 per cent load factor as well as the present 30 percent load load factor as well as the present 30 percent load factor. (Black-Arizona) W73-07650

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1.25-MGD ELECTRODIALYSIS PLANT IN

BRAEL,
Freeman/Halpern Associates, Tel-Aviv (Israel).
B. M. Halpern, and J. Olie.
Journal of the American Water Works Association, Vol 64, No 11, p 735-740. November 1972. 2

Descriptors: *Electrodialysis, *Desalination, *Reclaimed water, *Engineering structures, *Membrane processes, *Desalination plants, Saline water, Water quality, Arid lands, Water resources, Water treatment, Water softening, Ion exchange, Planning, Brine disposal, Cost analysis, Water supply development, Desalination processes, Water conservation, Desalination processes, Water conservation, Desalination ldentifiers: *Israel, Negev Desert.

One of the world's largest plants for water desalination by a membrane system is located in Israel's Negev desert. For the first time, full desalting and softening pretreatment of raw water by ion exchange is being applied in the electrodialysis plant. A general historical background of the plant is presented. The plant design, planning, water flow and storage, ion-exchange pretreatment process are described, and the key problem of brine disposal is discussed. One aspect of the overall project has been development of mobile electrodialysis unit completely self-contained, with its own diesel generator, pumps, and all other required equipment. It is used to carry out electrodialysis desalting tests on different types of well and surface water available in many places in Israel. Data are provided which gives information on engineering specifications and estimated costs of large commercial plant. (Black-Arizona) One of the world's largest plants for water

WATER RESEARCH AND DEVELOPMENT. For primary bibliographic entry see Field 06E. W73-07710

VERTICAL MULTI-EFFECT DISTILLATION

VERTICAL

PLANT,
United Kingdom Atomic Energy Authority, London (England). (assignee).

I. H. Newson, and M. H. Delve.

U. S. Patent No. 3,702,807, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 904, No 2, p 217, November 14, 1972.

Descriptors: *Patents, Brine, *Potable water, *Flash distillation, Separation techniques, Water treatment, Equipment, Distillation.

A multiple effect distillation plant is described in which the effects are arranged in super-position, the pressure in each being below that in the effect below. Riser passages communicate each effect with the adjoining effect. Passages are arranged with their lower ends in communication with superheated liquid. Flashing life imparted to such liquid raises the liquid to the next effect at lower pressure. Vapor separated from the liquid passes for condensation to the exterior of riser passages. The condensate is withdrawn and the residual liquor moves to the reservoir of the next stage. (Sinha-OEIS)

SOLAR STILL,

A. D. Evans.
U. S. Patent No. 3,703,443, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 904, No 3, p 384, November 21, 1972.

Descriptors: *Patents, *Solar stills, *Desalination, *Solar distillation, Solar radiation, *Demineralization, Potable water, Vaporization, Condensation, Sea water, Equipment, Water treatment, Water purification.

The solar still consists of a base frame, and means The solar still consists of a base frame, and means of flotation to support the device on water. A converter is supported by the base frame which also supports a membrane. Part of the membrane is transparent to permit access of solar radiation to the converter. Solar energy produces heat. A portion of the upward directed surface on the converter lies awash in the water to facilitate vaporization of the liquid by the heat. The encapsulated air cell within the still is sealed off from the surrounding atmosphere so that the distillate will surrounding atmosphere so that the distillate will condense on the interior surface of the membrane. The thermal convection currents within the air cell ane thermal convection currents within the air cell as well as the action of the wind and waves on the membrane cause the droplets of condensed distillate to flow outward and downward along the interior surface of the membrane and accumulate within an involute formed by that portion of the membrane which contacts the water. Means for removing the distillate are provided also. (Sinha-OEIS) W73-07752

3B. Water Yield Improvement

MANAGEMENT OF WINDBLOWN ALPINE SNOWS, Colorado State Univ., Fort Collins. Dept. of At-

mospheric Science.
For primary bibliographic entry see Field 02C.
W73-07151

PHYTOINDICATION OF CERTAIN HYDROLOGICAL AND GEODYNAMIC CONDI-TIONS OF TAKYRS IN THE UST URT DESERT, CERTAIN (IN RUSSIAN). S. V. Viktorov. Ekologiya. Vol 2, No 5, p 25-30. 1971.

Identifiers: Desert, Feather, Geodynamic condi-tions, Grass-M, Hydrological conditions, Phreatophytes, *Takyrs, USSR, *Ust-Urt desert, Wormwood-D, *Karst-suffosion.

Water movement along the surface of takyrs and karst-suffosion processes in the area were studied using vegetative communities and phytogenic relief as indicators. The presence of takyr ridges with vegetation arcs and the orientation of the arcs indicated areas of intense rusoff and its direction. Wormwood-feather grass-underbrush complexes on takyrs indicated different stages of karst-suffosion development. The presence of phreatophysics on the floor of formations with karst-suffosion relief indicated local accumulation of groundwater.—Copyright 1972, Biological Abstracts, Inc. W73-07217

ECOLOGICAL SIGNIFICANCE OF THE DEFORMATION OF ROOTS OF CERTAIN SHRUBS OF THE CENTRAL ASIAN DESERTS, (IN RUSSIAN), darstvennyi Pedagogicheskii Institut, Fer-

gana (USSR). V. P. Parpiev.

v. F. Farpiev.
Ekologiya, Vol 2, No 4, p 82-84, 1971. Illus.
Identifiers: "Calligonum-D, "Central Asian
Desert, Deformation, Deserts, Ecological studies,
Minerals, Moisture, Roots, Shrubs.

The enlargements found on the roots of species of Calligonum inhabiting the deserts of Central Asia are receptacles for organic and mineral substances and also moisture, and play a major adaptive role under the xeric conditions of the arid zone.—Copyright 1972, Biological Abstracts, Inc. W73-07338

CUMULUS CLOUDS AND THEIR MODIFICA-

CUMULUS CLOUDS AND THEM MODELLA.
TION,
National Oceanic and Atmospheric Administration, Coral Gables, Fla. Experimental Meteorology Lab.
J. Simpson, and A. S. Dennis.
Available from the National Technical Information Service as COM 72-10791, \$3.00 in paper
copy, \$0.95 in microfiche. National Oceanic and
Atmospheric Administration Environmental
Research Laboratories Technical Memorandum
ERL OD-14, May 1972. 148 p, 29 fig, 7 tab, 20 ref.

Descriptors: *Cloud physics, *Weather modifica-tion, *Cloud seeding, *Artificial precipitation, Methodology, Silver iodide, Condensation, Nucleation, Atmospheric physics, Meteorology, Storms, Precipitation (Atmospheric), Model stu-dies, Coalescence, Heat transfer. Identifiers: *Cumulus cloud modification.

Identifiers: *Cumulus cloud modification.

The modification of cumulus clouds is discussed in the framework of their importance to the energetics and transports of the large-scale atmosphere, as well as that of their role in precipitation production and water management. Present knowledge of cumulus physics and dynamics, and their interaction, is summarized, with emphasis on models and on the interaction of clouds in groups and populations. The various attempts at enhancing coalescence are described, including use of water spray, hygroscopic materials and electric fields. About 40% of the material concerns seeding supercooled cumuli with dry ice and silver iodide, beginning with the basic principles and methods used. Distinction is made between the static and dynamic approaches. In the former, it is sought only to after cloud microphysics by transforming a supercooled water cloud to one composed of ice, while in the latter, the latent heat of fusion is intended to increase buoyancy, invigorate updrafts, and increase cumulus growth. Other cumulus modification methods, actual and potential, are summarized, including radiative alterations, (e.g. carbon black), boundary layer modifications (such as asphalt coatings) and fires. (Woodard-USGS) W73-07386

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B-Water Yield Improvement

STUDIES OF THE RAIN CYCLES OF WARM CUMULI, Weather Science, Inc., Norman, Okla. For primary bibliographic entry see Field 02B.

ATMOSPHERIC MOISTURE EXTRACTION OVER THE OCEAN,
Geological Observatory, Lamont-Doherty Geological Observa Palisades, N.Y. For primary bibliographic entry see Field 02L W73-07397

AN INVESTIGATION OF HYDROLOGICAL ASPECTS OF WATER HARVESTING, Texas A and M Univ., College Station. Water

Resources Inst.

Resources Inst.
O. Wilke, J. Runkles, and C. Wendt.
Available from the National Technical Information Service as PB-218 681, \$3.00 in paper copy,
\$0.95 in microfiche. Technical Report 46, September 1972, 53 p, 19 fig, 9 tab, 35 ref. OWRR B071-TEX (2). 14-31-0001-3132.

Descriptors: *Water harvesting, *Catchments, *Runoff, Hydrographs, Oil, Erosion control, *Texas, Playas, Weed control, Simulation analy-

sis, *Slopes.
Identifiers: *Lubbock (Tex.), *Amarillo (Tex),
*Texas High Plains, Playa Lakes, Channel slopes.

Water harvesting is a potential source of water for arid and semi-arid lands. The objectives were to determine combinations of land surface treatdetermine combinations of hand surface treat-ments and land forming which result in efficient but inexpensive water harvesting catchments and to determine the optimum shape of catchments. In laboratory studies with inexpensive materials, crude oils exhibited the best sealing properties. However, by six months after application, 750 gal per a co for rude oil has no apparent effect on runoff from field plots. Water harvesting catchments constructed by grading the soil to form V-shaped val-leys and then compacting the surface yielded ru-noff equal to 31 to 43 percent of all precipitation. After rains, sand blown from such catchments may damage tender downwind vegetation. Some water erosion occurred, but, after two years, the basic shape and the performance of the catchments had not been damaged by erosion. of the Chemical weed control is recommended. The results of hydrograph simulation indicate that catchments should be as narrow as can be constructed easily with conventional equipment. A structed easily with conventional equipment. A catchment width of 16 ft may be about optimum. Catchment side slopes should be between 0.1 and 0.2. Generally, catchments should be no more than 1/8 mi long. With these side slopes and lengths, channel slopes can be as little as 0.002 without causing excessive loss of runoff. To prevent erosion, channel slopes should not exceed 0.005. Surfaces should be rolled with a rubber-tired roller for 15 to 2 to me are constructives should be for 1.5 to 3 hrs per ac. Drop structures should be installed at elevation changes to prevent erosion.
W73-07425

AN ANNOTATED BIBLIOGRAPHY ON WEATHER MODIFICATION, 1960-1969, National Oceanic and Atmospheric Administration, Rockville, Md. Environmental Science Infor-

mation Center.

A. E. Grim

A.E. CHIMES. Available from NTIS, Springfield, Va 22151 as COM-72 11287, Price \$6.00 printed copy. National Oceanic and Atmospheric Administration Technical Memorandum EDS ESIC-1, June 1972. 407 p.

Descriptors: "Weather modification, "Bibliographies, "Publications, "Abstracts, Cloud seeding, Artificial precipitation, Climatology, Cloud physics, Legal aspects, Hurricanes, Fog, Hail, Nuclear explosions, Environmental effects, Documentation, Information retrieval.

This annotated bibliography consists of 858 references on statistical evaluation of cloud seeding operations and potentialities, cloud seeding operations and experiments, legal aspects of weather modification, economic implications, hail control and lightning suppression, cloud and fog dissipation, atomic explosion effects, hurrican control, and large-scale climate modification for the 10-year period 1960-1969. Author, subject, and geographic indexes are included. (Woodard-USGS) W73-07544

SOLAR REFLECTANCE OF MONOLAYER COVERED AND CLEAN WATER SURFACES,

Virginia Univ., Charlottesville.

J. T. Beard, J. L. Gainer, and J. A. Wiebelt.

Bureau of Reclamation Report REC-ERC-72-23,

July 1972. 62 p, 21 fig. 15 tab, 43 ref, append.

Descriptors: "Monomolecular films, "Evaporation control, "Solar radiation, "Analytical techniques, Reservoirs, Alcohols, Dyes, Absorption, Diffusion, Water conservation, Energy budget, Mass transfer, Surface tension, Waves (Water), Temperature, Evaluation, Climatology, Investigations, Bibliographies.

Bibliographies.
Identifiers: Surface temperature, Evaporation retardants, Reflectivity, Water surface.

Monomolecular films, acting as diffusion barriers and simultaneously altering the reflective properties of water surfaces, can reduce evaporation. Analytical and experimental studies were made of Analytical and experimental studies were made of the radiant energy input to untreated and monolayer covered water surfaces. Values of direct solar radiation and energy absorbed by a water surface were computed and tabulated for different zenith distances, atmospheric pressures, and moisture and dust contents of the atmosphere. and moisture and dust contents of the atmosphere. Values for solar energy input to a smooth water surface were computed and tabulated for latitudes of 30, 35, and 40 deg, at elevations of 1000 and 5000 ft, and precipitable atmospheric moisture values of 10, 20, 30, and 40 mm on 8 typical days of 1 yr. Procedures for using these tabulations in the energy budget of water bodies are suggested. To estimate daily evaporation rates from water surfaces, an analytical model was developed to apply transient conditions to an element of a typical surface. surraces, an analytical model was developed to apply transient conditions to an element of a typical water reservoir covered by hypothetical films having different optical properties. Evaporation was reduced by 21% for a cetyl alcohol monolayer and 36% for a highly reflective monolayer with diffusion properties of cetyl alcohol. (USBR) W73-07557

EXPERIMENTS IN DROUGHT ALLEVAITION, Bureau of Reclamation, Denver, Colo. Div. of Atmospheric Water Resources Management.
C. J. Todd, and R. C. James.
Journal of the American Water Works Association, Vol 64, No 9, p 582-584, September 1972. 1

Descriptors: *Cloud seeding, *Water yield improvement, *Precipitation (Atmospheric), *Atmospheric physics, *Weather modification, Silver iodide, Water supply development, Legal aspects, Social aspects, Chemistry of precipitation, Storms, Seasonal, Clouds, Southwest U.S., Arizona, Arid lands, Evaluation, Planning, Storm water. Identifiers: *Project Skywater.

Current activities are summarized of Project Sky-water, a program sponsored by the Bureau of Reclamation and concerned with the investigation Reclamation and concerned with the investigation and development of the technology required for the management of atmospheric water, with considerations of legal, economic, ecological, and so-cial implications. It discusses general mechanisms of precipitation, cloud seeding attempts in winter mountain storms and summer cumulus clouds, current field research at experimental stations and pilot projects. Some of the states included in the discussion are: New Mexico, Arizona, Utah, Colorado, California, Wyoming, Montana, Nevada, and the Dakotas. Results are reported of drought alleviation attempts in the states of Texas, Arizona, and Oklahoma, where reaction time was 12, 7, and 19 days after initial request. All seeding operations were believed to increase local precipitation but lack of scientific data precludes sound evaluation. (Black-Arizona) W73-07649

CONTROL OF MESQUITE, University of the Panjab, Lahore (Pakistan). Dept. of Chemistry. M. A. Ghuman, Badar-ud-Din, and B. A. Nasir. Pakistan Journal of Scientific and Industrial Research, Vol 14, Nos 1-2, p 159-161, February-April 1971. 1 tab, 8 ref.

Descriptors: *Phreatophytes, *Mesquite, *Herbicides, *Chemcontrol, *Weed control, Land clearing, Chemicals, Arid lands, Cost analysis, Water conservation, Range management, Chemical ana ysis, Chemical properties, Brush, 2-4-5-T, 2-4-D. Identifiers: *Pakistan.

In Pakistan, mesquite has become the most aggressive weed in the irrigated plantation, riverain forests, rangelands, and agricultural fields, and causes obstruction in the construction of highways, parks, railroads, and water channels. Adoption of chemical control methods has recently been initiated. Foreign preparations used were either too expensive (2,4,5-T), or too expensive and ineffective (2,4-D). Two herbicides were consequently developed (81 KB and 82TB), and field trials were carried out to study these formulations alongside the already available foreign-made herbicides. Of the various herbicides studied, 81 KB, 82 TB, and 2,4,5-T in 50-75 per cent concentrations have been found to be most satisfactory, However, it is recommended that 81 KB and 82 usuons nave been found to be most satisfactory. However, it is recommended that 81 KB and 82 TB should be used in view of the low production cost. Cost per gallon of 100 percent solution of 81 KB and 82 TB is 10-12 rupees as compared to 75 rupees per gallon of 2,4,5-T. (Black-Arizona) W73-07653

SURVEY OF FLOODPLAIN VEGETATION ALONG THE LOWER GILA RIVER IN SOUTHWESTERN ARIZONA, Arizona Univ., Tucson. Office of Arid-Lands

E. F. Haase

Journal of the Arizona Academy of Science, Vol 7, No 2, p 75-81. June 1972. 2 fig, 3 tab, 19 ref.

Descriptors: "Surveys, "Vegetation, "Flood plains, "Phreatophytes, "Plant groupings, Plant populations, "Vegetation establishment, Transpiration, Evapotranspiration, River basins, Ariziona, Arid lands, Invasion, Environmental gradient, Environmental effects, Water yield improvement, Mapping, Aerial photography, Land clearing, Irrigation effects, Drainage effects, Tamarisk. Identifiers: Exotic plants.

The primary objective was to survey the vegeta-tional composition and ecological relationships that have resulted from an altered environment along a 93 km (58 mile) stretch of the lower Gila River Floodplain east of Yuma, Arizona. Contemrecords, recent literature and observations. Interpretation of the surveys using aerial photography as the primary data base. Conditions effecting vegetational development were inferred from historical records, recent literature and observations. Interpretation of the surveys resulted in the description of six communities. (1) Tender (2) Tenerity of six communities. terpretation of the surveys resulted in the description of six communities: (1) Typha, (2) Tamarix-Pluchea, (3) Prosopis, (4) Suaeda-Allenrolfea, (5) Atriplex, (6) Larrea-Prosopis. A high degree of environmental instability in the past resulting from vegetation removal, dam building, irrigation, and related changes in drainage patterns, has led

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Industry—Group 3E

rapidly to the dominance of the exotic Tamarix pentandra Pall. on over 50 percent of the 6,622 ha surveyed. Tamarix dominated communities are presently components of an unstable ecosystem because of their essentially monotype growth pattern, the danger of catastrophic fire, the unpredictably fluctuating groundwater table, and anticipated clearing of vegetation by man. Typha communities appear to have increased significantly in the last 20 years, but their considerable dependence on contamporary irrigation and drainage practices also limits the natural stability of the ecosystem. (Black-Arizona)

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3C. Use of Water of Impaired **Ouality**

SALINIZATION OF GROUNDWATER IN ARID

ZONES, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 04B.

EFFECT OF CALCIUM ON PERMEABILITY OF ROOTS OF PLANTS GROWN AT HIGH SODIUM CHLORIDE CONCENTRATION, Sind Univ., Hydernbad (Pakistan). Dept. of

S. Z. Hyder. Pakistan Journal of Scientific and Industrial Research, Vol 14, No 3, p 219-222, June 1971. 6 fig, 1 tab, 7 ref.

Descriptors: "Calcium, "Permeability, "Salt tolerance, "Plant physiology, Plant growth, Sodium chloride, Saline water, Growth rates, Rhizosphere, Ion uptake, Barley, Germination, Growth stages, Bioassay, Ions, Root development.

Concentration of some inorganic ions in the growth medium is an important factor in counteracting the adverse effects of salinity on plant growth. In this experiment, the calcium-sodium interaction was studied by measuring permeability of roots treated with high doses of NaCl at low and high calcium levels in their nutrient solution. Effect of calcium on loss of inorganic and organic ions from Hordeum vulgare plants was studied at fect of calcium on loss of inorganic and organic ions from Hordeum vulgare plants was studied at germination and at the first leaf stage when these plants were grown in low nutrient solution contain-ing high sodium chloride. The saline treatments resulted in greater loss of amino acids, Na24, C136, and K labelled with Rb from plants receiv-ing low Ca++ than from plants receiving high cal-cium in their growth medium. At low calcium, the greater loss of ions was due to increase in permea-bility of plant cells in this treatment. (Black-Arizona) Arizona) W73-07647

SOIL SALINITY PROBLEMS IN SHORELINE AREAS OF HAWAII, Hawaii Agricultural Experiment Station, Honolu-

S. A. El-Swaify, W. W. McCall, and S.

Sinanuwong.

Available from the National Technical Informa-tion Service as COM-72-10686, \$3.00 in paper copy, \$0.95 in microfiche. University of Hawaii Cooperative Extension Service Circular No. 462, April 1972. 12p, 4 fig, 2 tab. UNIHI-SEAGRANT-AR-71-01.

Descriptors: "Saline soils, "Salt tolerance, *Leaching, "Water management (Applied), *Hawaii, Land use, Agriculture, Salinity, Crop response, Soil management, Ponding, Irrigation practices, Sprinkler irrigation, Tidal effects, Shores, Reclamation, Soil treatment, Ion trans-

This booklet helps to identify some of the soil salinity problems associated with man-made development and activity, pictorially illustrates soil and plant symptoms of saline conditions, suggests proper selection of plants for saline soils, lists 37 agricultural plants and rates them according to their salt tolerance, and suggests steps to take in providing for proper irrigation management and salinity control. Hawaiian soils have excellent drainage as a whole, making it easy to apply extra water to prevent salt accumulation. However, the ponding method is less efficient than rainfall, and irrigation methods which simulate rainfall such as sprinklers are recommended. (Black-Arizona)

3D. Conservation in Domestic and **Municipal Use**

COMPUTER SIMULATION OF DESIGN CRITERIA FOR URBAN FLOW STORAGE

SYSTEMS, Hydrocomp International, Palo Alto, Calif. For primary bibliographic entry see Field 04A. W73-07163

EAST ST. LOUIS: THE RIVERFRONT CHARADE, Southern Illinois Univ., Edwardsville. Regional and Urban Development Studies and Services. For primary bibliographic entry see Field 06B. W73-07176

SEWERAGE AND WATER PLANNING RE-PORT (FOR) METROPOLITAN COUNCIL OF THE TWIN CITIES AREA, MINNESOTA. Metcalf and Eddy, Inc., Boston, Mass. For primary bibliographic entry see Field 05D. W73-07179

ANALYSIS OF THE REGULATION, OR-GANIZATION AND OPERATIONS OF A RE-GIONAL WATER MANAGEMENT INSTITU-TION FOUNDED IN 1846, Harbridge House, Inc., Boston, Mass. For primary bibliographic entry see Field 06E. W73-07417

MANAGEMENT HANDBOOK WATER DIVISION, METROPOLITAN DISTRICT COMMISSION.

Harbridge House, Inc., Boston, Mass. For primary bibliographic entry see Field 06E. W73-07418

COMPARISON OF RAINFALL-RUNOFF MODELS FOR URBAN BASINS, Indian Inst. of Tech., Kanpur. For primary bibliographic entry see Field 02A. W73-07439

'WATER SYSTEMS,' COORDINATION PLAN
AND DEVELOPMENT PROGRAM PHASE I 'WATER' SUPPLY 'SYSTEMS', WASTE
'WATER' POLLUTION CONTROL 'SYSTEMS',
AND SURFACE 'WATER' DRAINAGE
'SYSTEMS',
Ellers, Reaves, Fanning and Oakley, Inc., Memphis Temp.

Available from the National Technical Informa-tion Service as PB-211 829, \$7.50 in paper copy, \$0.95 in microfiche. Report No. MATCG-ER-72-0141-05, June 1972. 66 p. 7 fig, 12 tab, 38 ref, ap-

Descriptors: *Water management, *Planning, *Data collection, Water supply, Waste water disposal, Surface drainage, Utilities, Coordination, Tennessee, Mississippi, Arkansas.

Identifiers: *Water systems, *Inventories, *Mem-phis (Tennessee), Urban water systems, Objec-tives, Goals.

A basic inventory of water supply, wastewater pollution control, and surface water drainage facilities for the three county metropolitan Memphis, Tennessee area is presented. The inventory is the first phase of a study which will also include plan formulation and detailed facility requirements and programs. Based on existing reports and data from a great number of sources, the inventory attempts to order all this information into a singletempts to order all this information into a single framework. The data include service areas, treat-ment plant capacities, demands, and responsible agencies. A synthesis and analysis of numerous goals related to water resource systems, a brief planning prospectus discussing water service standards and planning opportunities, and an outline of interim procedures are included. (Elfers-North Carolina) Carolina) W73-07690

WATER AND SEWERAGE STUDY, LEE COUN-TY, ALABAMA. Harmon, White and Associates, Inc., Opelika,

Available from the National Technical Informa-tion Service as PB-211 541, 86.00 in paper copy, 80.95 in microfiche. Report No. ALA-HWA-X005-1009-01, June, 1972. 55p, 22 fig. HUD-AL-04-09-

Descriptors: *Planning, *Water supply, *Sewerage, Projections, Data collections, Utili-ties, Water requirements, *Alabama, Grants. Identifiers: *Utility extensions, *Inventories, *Lee County (Alabama), Federal Assistance Pro-

The water and sewerage study is an interim planning guide for the extension of water and sewerage systems in Lee County, Alabama. Some sewerage systems in Lee County, Alabama. Some short sketches of the general nature of the county including its soils, population, and economy, an in-ventory of the existing water and sewerage systems, including such factors as treatment facili-ties, waste loadings, water quality, and water requirements provide background information. A short section on water supply and waste loading projections to 1982, and an outline of four federal programs for financial assistance are included. The study is intended as a preliminary guide for local agencies involved in water resource manage-ment. (Ellers - North Carolina)

THE DENVER SYSTEM OF WATER WORKS CONTROLS, Denver Dept. of Water, Colo. For primary bibliographic entry see Field 08C. W73-07692

3E. Conservation in Industry

WATER FOR NEVADA: FORECASTS FOR THE FUTURE -- MINING, Nevada Bureau of Mines and Geology, Reno. For primary bibliographic entry see Field 06D.

ECONOMIC EVALUATION WITHIN THE WATER INDUSTRY, Metropolitan Water Board, London (England). For primary bibliographic entry see Field 06B.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

3F. Conservation in Agriculture

PLANNING AND UPDATING FARM IRRIGA-

TION SCEDULES, Technion - Israel Inst. of Tech., Haifa. Low dermilk Paculty of Agricultural Engineering. N. Buras, and A. M. Pistun.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IRI, Proceedings paper 9586, p 43-51, March, 1973. 5 fig, 8 ref., 2 append.

Descriptors: "Irrigation, "Irrigation engineering, "Irrigation programs, "Scheduling, "Management, Simulation analysis, Digital computers, Optimum development plans, Water resources, Soil moisture, Agriculture, Crops, Farms, Water supply, Distribution, Networks, Planning, Climatic data, Hydraulics, Systems analysis, Mathe-

The optimal scheduling of irrigation activities is a The optimal scheduling of irrigation activities is a considerably complex problem, requiring a large computational effort. Digital computers are useful in the planning process. A computer program is developed for the planning of irrigation schedules within the broader context of agricultural production, and for the updating of these schedules whenever necessary. The computer program, which is oriented toward solving problems arising during the busy irrigation season, is a simulation algorithm which schedules the application of water on the basis of soil moisture balances at given intervals of time. The irrigation requirements are then checked against the hydraulic characteristics of the farm water distribution system. Delays in of the farm water distribution system. Delays in replenishing the moisture deficiency within the root zone generate losses which are functions of the magnitude of the delay and of the vegetative status of the crop. The alternative schedule which minimizes these losses is selected. The program has the advantage that it allows the planning of farm irrigat on schedules to progress in stages; as current information regarding climatic and soil conditions, water supply, agrotechnical practices, and market conditions becomes available, the initial schedule can be quickly updated so as to reflect the changing environmental conditions. (Bell-Cornell) W73-07371

SYSTEMS ANALYSIS AND IRRIGATION PLANNING Harvard Univ., Cambridge, Mass. Center for

Population Studies. D. V. Smith.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR1, Proceedings paper 9625, p 89-107, March, 1973. 2 fig, 2 tab, 64 ref.

Descriptors: *Irrigation, *Irrigation programs, *Project planning. *Systems analysis, Optimization, Linear programming, Stochastic processes, Economic analysis, Agriculture, Groundwater, Water resources, Mathematical models, Hydrology, Dynamic programming, Identifiers: Deterministic models.

Certain concepts and techniques of systems analy-sis can aid irrigation planning in poor countries that have social and physical environments radi-cally different from those found in industrialized nations with extensive irrigation practice. An ample literature survey is followed by description of the basic deterministic planning model, a model emphasizing the interactive consequences of cropping pattern selection, conjunctive use of ground and surface water, and employment of wells as water table control devices. Stochastic parameters are introduced into the model to im-prove its representation of reality and to interpret meaningfully the consequences of stochastic variability. Various factors favor the use of the chance-constrained approach to stochastic programming. Unlike previous applications, general distribution functions, variable capacities piecewise linear decision rules, and stochastic de mands and supplies are dealt with. (Bell-Cornell) W73-07378

RECENT WATER RESOURCES DEVELOP-MENT IN TAIWAN, REPUBLIC OF CHINA, Taiwan Power Co., Taipei. For primary bibliographic entry see Field 04A. W73-07390

CROP RESPONSE TO EXCESSIVE ZINC FER-TILIZATION OF ALKALINE SOLL,
Agricultural Research Service, Prosser, Wash.
L. C. Boawn, and P. E. Rasmussen.
Agronomy Journal, Vol 63, No 6, p 874-876, 1971.
1 fig. 4 tab, 6 ref.

Descriptors: "Crop response, "Saline soil, "Zinc, Fertilization, Soil treatment, Soil contamination effects, Toxicity.
Identifiers: Zinc fertilization, Zinc toxicity.

The objective was to evaluate the tole The objective was to evaluate the tolerance of economic plant species to excessive levels of available Zn in the soil. Fifteen field crop and available 2 in the sout Taken has clop and three vegetable crop species were grown under uniform conditions in a growth chamber in alkaline soil treated with 10, 100, 200, 300, 400, 500 ppm 2n. Response was evaluated in terms of dry matter yield decrease (YD) and Zn concentration in tops. yield décrease (YD) and Zn concentration in tops. Grass species were most sensitive and had maximum YD's greater than 40%. Alfalfa (Medicago sativa L.) Alaska pea (Pisum sativum L.), Tomato (Lycopersicon esculentum Mill.), lettuce (Latuca sativa L.), spinach (Spinacia oleracea), and surgarbeet (Beta vulgaris L.) had YD's between 20 and 40%. Field bean (Phaseolus vulgaris L.), snap bean, russet potato (Solanum tuberosum L.), and Perfection pea (Pisum sativum L.) did not undergo a significant YD. Zinc concentrations in toos as-Perfection pea (Pisum sativum L.) did not undergo a significant YD. Zinc concentrations in tops associated with a 20% YD ranged from 240 ppm for field bean to 740 ppm for sugarbeet, with most crops falling in a 400 to 600 ppm range. The most sensitive species tolerated Zn additions of 200 to 300 ppm before undergoing a significant YD. Crops that underwent a significant YD because of excess Zn were stunted but showed no discoloration, malformation, or necrosis indicative of a tion, malformation, or necrosis indicative of a direct metal toxicity. (Skogerboe-Colorado State)

BASIC PROBLEMS IN THE WATER ECONO-MY OF AGRICULTURE, Water Economics Research Inst., Warsaw (Po-

C. Kryszan, and J. Nowicki.

Available from the National Technical Information Service as Part of TT70-55098/7, \$3.00 in paper copy, \$0.95 in microfiche. In: Water Economy, 1972, p 35-51, 3 fig, 16 ref. Translation of Gospodarka Wodna, Vol 30, No 7, 1970.

Descriptors: *Irrigation, *Agriculture, *Planning, Water management (Applied), Evapotranspiration, Retention, Climates, Reservoirs.

Agricultural water management must cope with Agricultural water management must cope with three basic problems: (1) the quantities of water consumed in the process of plant production, (2) the effective useful retention of the soil, and (3) the changeability of climatic conditions. Water consumption in plant production, or evapotrans-piration, is the sum of plant transpiration and physical evaporation from soil and plants. The value of evapotranspiration can be determined by empirical methods and by means of formulas, which represent generalizations of the empirical studies. Several formulas are discussed and their usefulness in water management evaluated. The water retention capacity of the soil can limit the usefulness of irrigation in two ways. First, a given type of soil can assimilate only so much water before the saturation point is reached. At the other extreme, too little water content in the soil creates a situation in which the soil's retention force exceeds the sucking force of the plant roots. The variability of climatic conditions must be adequately understood in order to evaluate the need for irrigation, the value of the water deficits to be met with supplementary irrigation, and the design and capacity of water reservoirs for irrigation. (Settle-Wisconsin)

METHODS OF IRRIGATION AND WATER REQUIREMENTS OF BEANS, (IN BULGARI-

Academy of Agricultural Sciences, Ruse (Bul-garia). Research Inst. of Agriculture. M. Vitkov, and M. Petkov. Rastenievd Nauki. Vol 9, No 3, p 73-79. 1972. En-

glish summary.

Identifiers: *Irriation practices, *Crop response, *Beans D, Irrigation effects, Crop production.

Soil wetting to a depth of 60 cm by sprinkler irriga-tion results in greatest increase in the bean yields. On a 4 yr mean the yields surpassed those of the control by 950 kg/ha. Yields of bean crops in which the soil was moistened to a depth of 40 cm wince the sou was mossened to a depth of 40 cm by sprinkling and followed by surface irrigation were the lowest. During the 4 yr test period the consumptive use of water ranged from 3000-3460 cu m/ha.—Copyright 1972, Biological Abstracts, W73-07477

EFFECT OF FERTILIZER AND IRRIGATION ON THE PHYSICAL PROPERTIES OF GRAIN AND ANATOMICO-MORPHOLOGICAL STRUCTURE OF THE CARYOPSIS OF WHEAT, (IN RUSSIAN),
Tekhnologicheskii Institut Pishchevoi i Kholodilnoi Promyshlennosti, Odessa (USSR).
L. R. Torzhinskaya, N. G. Umleva, and V. M. Antonyuk

Izv Vyssh Uchebn Zaved Pishch Tekhnol. 3, p 11-

Identifiers: *Caryopsis, Fertilizers, Grain, Irriga-tion, Morphological structure, Weather, *Wheat-

The degree of utilization of fertilizer by wheat plants depends on the meteorological conditions of the harvest year, which in turn affects the physical properties of wheat grain and its anatomicomorphological structure. The cultivation of wheat on irrigated plots with the use of N fertilizers causes thickening of the peripheral anatomic parts of the caryopsis and reduces the size of the groove in the caryopsis.—Copyright 1972, Biological Abstracts, Inc.
W73-07496

IRRIGATION REGIMEN OF MAIZE GROWN ON LEACHED CINNAMON FOREST SOIL IN THE REGION OF THESTARA ZAGORA IR-THE REGION OF THESTARA ZAGORA IRRIGATION SYSTEM AT VARIOUS LEVELS OF
FERTILIZING (IN BULGARIAN),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria),
A. Raicheva-Mehandzhieva.

Rastenievod Nauki, Vol 8, No 1, p 49-69, 1971, Il-

Nascenerous and Mariana, lus, English summary, Identifiers: "Bulgaria, Cinnamon, Fertilization, Forests, Irrigation, "Leached soils, "Maize-M, Regimen, Soils, Stara, Yields, Zagora.

Irrigation of maize grown on leached cinnamon forest soil was more effective than fertilizing. Fertilization boosts yield by up to 22% compared with the nonfertilization-nonirrigation treatment, while irrigation increased it by over 3 times. The com-bination of fertilizing with irrigation produced the greatest effect on yield, the increase reaching up to 4.5 times compared with fertilized-nonirrigated maize, 1.7 times compared with nonfertilized-irrigated maize, and 5.5 times in comparison with nonfertilized-nonirrigated maize. The yield increase ranged from 5-9% at higher levels of fertilizing when the nutrients were enhanced by 50%. The return in grain per kg active matter was higher at lower levels of fertilization, ranging from 5.63-11.96 kg grain. The number of plants/0.10 ha (4080) may be considered as a limiting factor in obtaining maximal yields at higher level of fertilizing. Highest yield for the 4 yr was obtained by maintaining the soil moisture at 80-80-80% of the field capacity, from 920-970 kg/0.10 ha Lowering preirrigation moisture in the third period of maize development leads to no large yield decrease, by 51-46 kg/0.10 ha grain, the better return being obtained/100 m3/0.10 ha water used.—Copyright 1972, Biological Abstracts, Inc.

STUDY ON SOME TOBACCO ROTATIONS WITH CATCH-, AND INTER CROPS GROWN UNDER IRRIGATION IN KHASKOVO REGION

(IN BULGARIAN), Academy of Agricultural Sciences, Khaskovo (Bulgaria). Complex Experimental Station.

Rastenievod Nauki. 9 (3): 95-105. Illus. 1972. En-

glish and Russian summary.
Identifiers: "Bulgaria, Catch, Crops, Forage,
Grown, Irrigation, Khaskovo, Pea-D, Rotations,
Rye-M, Spring, "Tobacco-D, Wheat-M, Winter.

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Continuous tobacco growing in monoculture without companion crops and with mineral fertilizers leads to a steady decrease in yields regardless of the level at which other agro-technical measures of the level at which other agro-technical measures are applied. Winter pea, spring pea, pea-wheat mixture and rye as intercrops variously retard the decline in yield. This is due to changes in the soil fertility caused by the debris yearly plowed under and to an increase in the soil N level after leguminous crops. Tobacco grown after winter pea produced the highest yield, 123%, compared to the control (tobacco in monoculture). This was equal to the application of 11 tons/ha of farmyard manure. Under irrigation and optimum production conditions tobacco may be steadily grown in succession with grain- and leguminous forage crops as 2 crops may be grown yearly in each field. Such a system of land use increases the forage production. Rotations such as wheat for grain plus slage system or land use increases the forage produc-tion. Rotations such as wheat for grain plus silage maize, followed by winter pea for soiling plus tobacco; winter pea for soiling plus grain maize, followed by pea mixed crop for soiling plus tobac-co, were suitable as 2 yr combinations.—Copyright 1972, Biological Abstracts, Inc. W73-07586

INFLUENCE OF THE POST-IRRIGATION SOIL CULTIVATIONS UPON THE DEVELOPMENT AND YIELD OF COTTON (IN BULGARIAN), Academy of Agricultural Sciences, Chirpan (Bul-garia). Inst. of Cotton. G. Nikolov.

Rastenievd Nauki, Vol 9, No 3, p 107-116, 1972, Il-

lus, English summary.
Identifiers: *Cotton-D, Cultivations, Irrigation,
*Soil cultivations, Wheat-M, Yield.

The post-irrigation soil cultivations did not affect the post-trigation soft cultivations on not affect the amount of soil moisture, the length of the periods between 2 water applications, the depths of the single water applications, the total amount of irrigation water given to the crop, or the comor irrigation water given to the crop, or the com-pactness and stiffness of soil. The size of the cot-ton plant, the structure of yield (number and size of bolls) and its qualitative indices also were not affected. Post-irrigation cultivations of soil did not influence the earliness and overall yield of cotton and the yield of the following crop (wheat).—Copy-right 1972, Biological Abstracts, Inc. W73-07590 INFLUENCE OF FURROW AND SPRAY IR-RIGATION UPON THE COTTON YIELD, (IN BULGARIAN), Academy of Agricultural Sciences, Khaskovo (Bulgaria). Complex Experimental Station, K. Karev.

Rastenievd Nauki. Vol 9, No 3, p 81-93. 1972. Illus.

Rastenievo Nauki. Vol 9, No 3, p 81-93, 1972. Illus. English summary. Identifiers: "Cotton-D, "Furrow irrigation, Nitrogen, Phosphorus, Potassium, Spray irriga-tion, Yield.

tion, Yield.

Under equal water and nutrient regimes in a soil, a spray irrigated crop yielded 17.1-21.5% more unginned cotton than a furrow irrigated crop. The surplus yield was 4.7-8.6% higher in all variants in which the soil moisture was maintained over 75% of the field capacity to a depth of 40 than of 70 cm. The cotton crop fertilized at N60P90K30 and at N120P180K60 outyielded the unfertilized crop by 12.9 and 23.1%, respectively. One m3 of irrigation water delivered by spraying raised the yield by 28.6% compared to the same amount of water delivered by surface irrigation. One kg of active substance (N0.34P0.50K0.16) introduced into the soil at the fertilizing level of N60P90K30 increased the raw cotton yield by 60%, fertilizing by 25% and their interaction by 120% or the latter increased the yield by 35% in comparison with their 1-factor action. The combined use of both methods of irrigation, the fertilizing level of N120P180K60 in kg/ha and soil wetting to a depth of 40 cm during the critical bloom-fruiting subperiod were most effective. Spray irrigated plants yielded 133.2%, and furrow irrigated plants 117.3% more than unirrigated and unfertilized plants.—Copyright 1972, Biological Abstracts)

IRRIGATING REGIME OF TOBACCO GROWN IN THE SANDANSKI-PETRICH REGION, (IN

Academy of Agricultural Sciences, Sandanski (Bulgaria). Complex Experimental Station.

Rastenievod Nauki. Vol 9, No 2, p 77-88, 1972. En-

glish summary. Identifiers: Blooming, *Bulgaria, Height, *Irriga-tion, Leaf, Regime, *Tobacco-D.

A correct irrigating regime during the second and third periods of tobacco development affects the plant height, size of leaves and blooming phases. Maintenance of optimum soil moisture (0-60-50 and -70-0%) in dry seasons increases the yield by 6.00%. Maintenance of optimum soil moisture (0-00-30 and -70-0%) in dry seasons increases the yield by 50-60% in comparison with non-irrigated plants while in wet seasons the effect declines considerably (10-4%). The yield increase in the respective variants averaged from 36-39%. The yield eclines both at high (0-70-60%) and low (0-50-0%) antecedent soil moisture by about 5-9% in comparison with soil moisture of 0-60-50%. Irrigation improves the quality of tobacco, particularly at soil moisture of 0-60-50%. Irrigation improves the quality of tobacco, particularly at soil moisture levels the quality declines. An optimum irrigating regime requires from 3-5 water applications at the phases of intensive growth initiation (30-35 days after transplanting), bud formation and bloom beginning. In dry years it should be given two more water applications, namely one prior to the stage of intensive growth and one at mass bloom. Copyright 1972, Biological Abstracts, Inc. W73-07638

PARTICULARS CONCERNING ROOT SYSTEM INCREASE DURING THE INITIAL PERIOD OF DEVELOPMENT OF CERTAIN AGRICULTURE CROPS ACCORDING TO SOIL MOISTURE, (IN BULGARIAN),

Z. Dimitrov. Rastenievod Nauki. Vol 9, No 2, p 55-62, 1972. Il-

Identifiers: Agriculture, Bean-D, Corn-M, Crops, Moisture, Pea-D, *Root systems, *Soil moisture, Sunflower-D, Tomato-D, Wheat-M.

Tests were conducted (1969-1970) under strictly controlled conditions to establish the particulars of root system development as a function of soil moisture in wheat, corn, sunflower, beans, peas, tomatoes, etc. cultivated in moist prairie soils. The plants cultivated in soils with a field hydration limit of 70% showed the best productivity and optimal development of their root systems. The plants exhibited the type of development characteristic of their root system regardless of soil moisture. "Copyright 1972, Biological Abstracts, Inc. W73-07639

EFFECTS OF METHOD OF PLANTING, RATE OF PLANTING AND ROW POSITION ON BEDS ON THE GROWTH AND GRAIN YIELD OF

BARLEY, Arizona Univ., Tucson. Dept. of Agronomy and

Plant Genetics.
A. D. Day, F. Turner, and R. M. Kirkpatrick.
Progressive Agriculture in Arizona, Vol 24, No 2, p 4-5, March-April 1972. 2 tab, 4 ref.

Descriptors: "Planting management, "Productivity, "Barley, "Agronomy, "Plant groupings, "Comparative productivity, Methodology, Plant growth, Growth stages, "Arizona, Arid lands, Saline soils, Irrigation water, Salt tolerance, Seeds, Grains (Crops), Crop production, Crop response, Soil

Experiments were conducted from 1969-1970 at Safford, Arizona, to determine some effects of method of planting, rate of planting, and row position on beds on growth and grain yield of spring barley planted in saline soil. Water for irrigation came from (1) wells with a high total soluble salt content (2,000 ppm) and a high sodium absorption ratio (9.3), and (2) the Gila River, with a lower concentation of soluble salts (864 ppm) and a more enavorable sodium absorption ratio (5.0). Elevated beds were prepared and oriented North to South in one experiment and East and West in a second. Two methods of planting were studied: (1) seven drilled rows, 6 inches apart, over the entire bed furrow, and (2) two rows, 12 inches apart on top of each bed. Two planting rates were compared: (1) 5 lb/acre, and (2) 50 lb/acre. Each year, seed of 'Arivat' barley was planted in November, in dry 25 lb/acre, and (2) 50 lb/acre. Each year, seed of 'Arivat' barley was planted in November, in dry soil, and irrigated-up. In beds planted East to West, barley on the warmer, south side were taller, had more heads per unit area, more seeds per head, and produced more grain than plants on the North. In beds oriented North to South, plants on the East side were taller, had more heads and heavier seeds per unit area, than plants in rows on the West side. The 25 pounds per acre rate of planting on E-W beds resulted in plants with more seeds per head, heavier seeds and higher grain yields than did the 50 pounds per acre rate. The 25 pounds per acre rate on N-5 beds resulted in plants with more heads per unit area and more seeds per pounds per acre rate on N-S beds resulted in plants with more heads per unit area and more seeds per head than did the 50 pounds per acre rate. Drilled method of planting on E-W beds resulted in plants with more heads per unit area and fewer seed per head than did the two-row method. The drilled method on N-S beds resulted in plants with more heads per unit area and less seeds per head than did the two-row method. The drilled method on N-S beds resulted in plants with more heads per unit area and less seeds per head than did the two-row method. (Black-Arizona)

A STUDY ON DENSITY AND SPECIES OF AZOTOBACTER IN SOIL, WATER, AND LEAF SAMPLES FROM SOUTHERN IRAQ, Institute for Applied Research on Nat Resources, Baghdad (Iraq). For primary bibliographic entry see Field 05B. W73-07640.

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

ROOT ANATOMY AND GROWTH RESPONSES OF BLUE PANICGRASS (PANICUM AN-TIDOTALE RETZ.), Arizona Univ., Tucson. Dept. of Agronomy. L. N. Wright, G. A. McCoy, and A. K. Dobrenz. Journal of Arizona Academy of Science, Vol 7, No 2, p 82-84, June 1972. 2 fig, 2 tab, 12 ref.

Descriptors: "Plant morphology, "Growth rates, "Environmental effects, "Adaptation, "Plant physiology, "Root development, Roots, "Arizona, Arid lands, Agronomy, Plant breeding, Grasses, Rhizosphere, Leaves, Moisture stress, Vascular tissues, Drought tolerance, Water utilization, Stomata, Root zone, Root systems, Growth stages.

Establishment of an association b cal characteristics and physiological responses in plants could be an aid to plant breeders in screening and selecting procedures for plant improvement of biological efficiency. The objectives were to study root anatomy of blue panicgrass and determine the association of anatomical characdetermine the association of anatomical charac-teristics with growth responses. Leaf thickness of blue panicgrass clones decreased with increased soil-moisture stress, and clones most efficient in water use had the highest number of total and secondary vascular bundles in the leaves. Fresh weight, dry weight, total protein, and several amino acids were significantly associated with ef-ficiency of water use, while a nonsignificant as-sociation was found between seeding drought tolerance and efficiency of water use. Stomate density was significantly different among clones of blue panicgrass with highest stomate density asdensity was significantly different among clones of blue paniegrass with highest stomate density associated with least seedling drought tolerance. No association was found between efficiency of water use and stomate density. Youngest leaves and upper leaf surfaces had fewer stomates with no difference in density among positions on a leaf surface. (Black-Arizona) W73-07646

UTILISATION AND TAXONOMY OF THE DESERT GRASS PANICUM TURGIDUM, Birmingham Univ. (England), Dept. of Botany. J. T. Williams, and R. M. Farias. Economic Botany, Vol 26, No 1, p 13-10, January-March 1972. 5 fig., 1 tab, 38 ref.

Descriptors: "Range management, "Soil stabiliza-tion, "Forage grasses, "Drought resistance, "Range grasses, Systematics, "Erosion control, Grasses, Desert plants, Soil conservation, Arid lands, Plant breeding, Land reclamation, History, Distribution patterns, Water requirements, Productivity.
Identifiers: Sahara, *Egypt, *Arabia.

Panicum turgidum Forssk. has been considered economically important because of use as a sand binder, forage plant in arid areas, and as a source of grain. With its extreme drought resistance, imof grain. With its extreme drought resistance, improved breeding may provide an inexhaustible source for the rehabilitation of impoverished ranges. The historical background of this plant is presented, tracing it to parts of Egypt and Arabia. Its geographical distribution is described and general climatic requirements are included. Its use as a sand binder, fodder grass, and emergency food for human needs is also discussed. Taxonomy of this species is clarified, and some specific characters of identification are listed. Sand culture experiments carried out in preliminary studies ematers of neutrination are listed; said contine experiments carried out in preliminary studies compared plants from Palestine and Arabia with plants from the Mauritanian Adrar. There was lit-tle response to nitrogen, but in phosphorus and potassium cultures, the vegetative yield of the Palestine and Arabian collections were up to twice that of those from Mauritania, especially at low levels of the nutrients. This correlated with the levels of the nutrents. It is suggested that seed from the Middle East could usefully be introduced into the Sahara regions and possibly other arid en-vironments to improve range conditions. (BlackFUTURE ALTERNATIVES AFFECTING THE AGRICULTURAL DEMAND FOR WATER AND LAND; THE EFFECTS OF SOY PROTEIN MEATS AND NITROGEN FERTILIZER RESTRICTIONS ON FUTURE WATER AND

LAND USE, Iowa State Univ., Ames. Center for Agricultural Rural Deve

and Rural Development. H. C. Madsen, E. O. Heady, S. H. Hargrove, and

K. J. NICOL Available from the National Technical Informa-tion Service as PB-211 444, \$4.85 in paper copy, \$0.95 in microfiche. Summary report prepared for \$0.95 in microfiche. Summary report prepared the National Water Commission. June 1972, 890.

Descriptors: "Planning, "Land use, "Evaluation, "Economic impact, "Projections, "Water policy, Water demand, Agriculture, Water resources, Fertilizers, Crop production, Economic feasibility, Economic justification, Water conservation, Water utilization, Nitrogen, Economic prediction, Decision making, Administration, Competing uses, Regulations, Linear programming, Models.

This study evaluates the impact on land and water needs and farm prices if in the year 2000 either (1) needs and farm prices if in the year 2000 either (1) meat analogs (e.g. soy protein) or meat extenders (e.g. fillers in meat loaf) were substituted for part of the beef consumption or (2) nitrogen fertilizer application were restricted to (a) 110 pounds/acre (approximate current level of application) or (b) 50 pounds/acre. The first of these alternatives would reduce the agricultural demand for land and water resources and would therefore free them for other uses. The second alternative would increase the demand for land and water resources and intensify competition between food production and other competition between food production and other competition between food production and other competition between food production and other uses of these resources. Results of the soy protein meats policy models indicate that with soy protein meats accepted by consumers, productive capaci-ty of U.S. agriculture would surpass any level previously experienced by this nation. Results of the two fertilizer limitation policy models indicate previously experienced by this nation. Results or the two fertilizer limitation policy models indicate that a mild restriction would not strain the produc-tive capacity of U.S. agriculture. A severe restric-tion, however, would reduce the supply capacity considerably. The study is based on a large-scale lease rearranging model of agriculture in the linear programming model of agriculture in the United States. (Black-Arizona) W73-07651

SOIL SALINITY PROBLEMS IN SHORELINE AREAS OF HAWAII,

Hawaii Agricultural Experiment Station, Honolu-

For primary bibliographic entry see Field 03C.

DRAINAGE OF AGRICULTURAL LAND, A PRACTICAL HANDBOOK FOR THE PLANNING, DESIGN, CONSTRUCTION AND MAINTENANCE OF AGRICULTURAL DRAINAGE SYSTEMS.

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04A. W73-07658

IRRIGATION INFLUENCE ON THE CHEMI-CAL COMPOSITION OF GRAIN IN CERTAIN WINTER SOFT WHEAT VARIETIES,

Academy of Agricultural Sciences, To (Bulgaria). Inst. of Wheat and Sunflowers. I. Doncheva, and C. Rachinska.

I. Doncneva, and C. Rachinska.
Rastenievod Nauki. Vol 9, No 2, p 63-70, 1972. Illus. English summary.
Identifiers: Ammonium, Chemicals, Chlorides,
Fats, Gliadin, Glutenin, Grain, Irrigation,
Minerals, Potassium, Starch, Trypotphan,
Withers Withers Minerals, Potassi

Winter soft wheat varieties 'Bezostaya 1,' 'Mironovskaya 808' and 'Skorospelka 3b' were studied under natural conditions in 1968 and 1969. Results from maintaining the soil moisture over 70% of the field capacity were compared with

those obtained from non-irrigated crops. Amm um nitrate at 300 kg/ha, superphosphate at 500 kg/ha and potassium chloride at 150 lg/ha were applied. The influence of irrigation upon the chemical composition of grain was traced by samples taken at milk, wax and full ripeness stages. Contents of the essential amino acid tryptophan, starch fats, mineral substances and P2O5 as changing under the influence of an increased soil moisture were determined. Total and protein N content as well as the fraction composition of protein were also determined. Soil moisture of over 70% of the field capacity, combined with an optimum fertilizing, alters the chemical composition of grain and improves its quality. The tryptophan content of grain increases. Under such conditions 'Mironovskaya 808' wheat variety synthetizes the most tryptophan. P content rises and a tendency toward an increasing quantity of fats and mineral substances is also observed. An optimum soil moisture creates conditions under which the plant nutrients find a manimum utilization as a result of which more protein substances and less starch are synthetized in the wheat grain. The fraction composition of protein changes by increasing the content of nealy all fractions and ostly, of the glutenin and gliadin. 'Skorospelka 3b' variety has accumulated most protein in its grain in both variants of the conducted trial.-Copyright 1972, Biological Abstracts, Inc. W73-07705

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO, PART IL For primary bibliographic entry see Field 06E. W73-07706

ON THE WATER CONSUMPTION OF MAIZE GROWN AS A STUBBLE-SILAGE CROP, (IN BULGARIA), Institute of Water Engineering and Land Improve-

ment, Sofia (Bulgaria). Y. Delibaltov, and G. Tashkov.

Rastenievod Nauki. Vol 8, No 10, p 65-79, 1971. Illus. English summary.

Identifiers: Crop, Growth, Irrigation, *Maize-M, Moisture, Season, *Silage, Soil, *Stubble.

The consumptive-use of water of furrow irrigated post-harvest silage maize averaged from 2780-3200 m3/ha for a 3-yr period. Besides the biological peculiarities and weather conditions, the length of the irrigation season and antecedent soil moisture are of great importance for the amount of consumptive-use of water. Daily water consumption in phases of growth and development as well as through the vegetation period of post-harvest maize changes according to the extent of available water supply and stress of meteorological factors. It is the highest in the period from the 9th leaf developed until tasseling, in which factors condition an intensive evaporation and development of a large vegetative mass. Through the same period the daily consumptive use varies between 47.5 and 55.4 m3/ha. Water is most effectively used at maintaining an antecedent soil moisture of over 65% of field moisture capacity. An improved or decreased water supply of plants leads to a lower effectiveness of water use.--Copyright 1972, Biological Abstracts, Inc. W73-07707

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

COMPUTER SIMULATION OF DESIGN CRITERIA FOR URBAN FLOW STORAGE

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d at over d or ower 972 CRITERIA FOR URBAN FLOW STORAGE SYSTEMS, Hydrocomp International, Palo Alto, Calif. N. H. Crawford. Available from the National Technical Information Service as PB-218 827, \$5.45 in paper copy, \$0.95 in microfiche. Final Report, January 1973, 109 p, 55 fig. 13 tab, 7 ref, append. OWRR-C-3235 (3704) (1). 14-31-0001-3704.

Descriptors: *Urban drainage, Computer models, *Water storage, *Design criteria, Drainage systems, *Flood frequency, Runoff, Model studies, *Simulation analysis, *Storm runoff, *Storage requirements, Storage capacity, Withdrawal. Identifiers: Transient storage.

Digital computer simulation methods are used to develop design methods for urban flow-storage systems. Two cases are examined: storm drainage systems. Two cases are examined: storm drainage that flows into storage and is pumped into receiving water with a variable stage, and storm drainage systems with restricted outflows. To adequately develop urban storm runoff, continuous simulation of the hydrologic process was necessary. Through this technique, flood frequencies for various designs were compared. With these results, it was clear that: (1) the continuous simulation of the period rainful is necessary for urban stages. was clear than: (1) the communus muniation of short time period rainfall is necessary for urban design, (2) retention basins should be designed to capture only the peak runoff, (3) storage basins are most effective on reaches with little natural transient storage, (4) precipitation frequency curves alone are not adequate for design (5) instan-taneous peak flows (recorded or estimated) are not adequate heaves they do not expressed the cause taneous peak Hows (recorded or estimated) are not adequate because they do not represent the conduit transient storage, (6) the Rational Formula is inadequate for urban design purposes, and (7) the choice of a design storm for an urban drainage system may develop inconsistent peak frequencies among the different reaches in the system. A computer model was developed to assist a designer in evaluating the amount and return of transient storage within a proposed design system. W73-07163

DYNAMIC COMPUTER SIMULATION AND CONTROL METHODS FOR WATER DISTRIBUTION SYSTEMS, General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

R. DeMoyer, Jr., H. D. Gilman, and M. Y.

Goodman.

Available from the National Technical Information Service as PB-218 826, \$3.00 in paper copy, \$0.95 in microfiche. Technical Information Series Document No. 73SD205, Feb., 1973, 255 p, OWRR C-3166 (No 3734) (i).

Descriptors: "Water distribution, "Automatic control, "Regression analysis, "Water demand, Networks, Simulation analysis, Computer models, Model studies, Time series analysis. Identifiers: "Control strategy, "Supervisory control (Water), "Time-varying simulation.

The major objectives were to: (1) build a computerized testbed for simulating the operation of a water distribution system over a variable time; and (2) develop control methods for on-line operation which minimize operating costs and pump cycling while maintaining satisfactory customer service. The objectives required the development of: (1) daily system demand model from real operating

data; (2) standard network model; (3) regression model, from operating data; (4) control models for turning pumps on/off; (5) energy/cost model to evaluate a control model; (6) dynamic capability for operating the regression or network models over a variable time. The studies were based upon data from a Philadelphia district containing 2 pumping stations and 2 tanks which meet an average demand of 31 MGD. Control studies include best instantaneous pump efficiency, floating tank, manual supervisory control and a newly developed concept of tank depth-demand ratio. Regression and network modeling comparisons are also included. FORTRAN IV for the GE-605 timesharing computer is used. Flow charts, listings timesharing computer is used. Flow charts, listings and user's manual are provided. W73-07165

DYNAMIC CONTRIBUTING AREA MODEL FOR RUNOFF ESTIMATION BASED ON STREAM NETWORK GEOMORPHOLOGY-A-PPLICATION TO SMALL INDIANA WATERSHEDS, Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02A. W73-07169

A STUDY OF FLOODPLAIN DEVELOPMENT AND FLOODPLAIN REGULATIONS. Greater Anchorage Area Borough, Ale Planning Dept. For primary bibliographic entry see Field 06F. W73-07175

BIOLOGY AND CONTROL OF AQUATIC NUISANCES IN RECREATIONAL WATERS, Wisconsin Dept. of Natural Resources, Madison.

L. A. Lueschow. Technical Bulletin No 57, 1972. 36 p, 3 fig, 8 tab, 7

Descriptors: "Control, "Nuisance algae, "Aquatic weed control, Algae control, Water pollution, Recreation, Eutrophication, Wisconsin, Lakes, Herbicides, Sodium arsenate, 2-4-D, Mechanical control, Chemcontrol, Cyanophyta, Chlorophyta, Chara, Anabaena, Bacteria, Trophic level, Rooted aquatic plants, Copper sulfate, Application methods, Cladophora, Vectors, Diatoms, Rates of application, Submerged plants, Floating plants. Identifiers: Swimmers' itch.

such as efforts for the control of accumula-Inasmuch as efforts for the control of accumulation of nutrients and thus reduce aquatic nuisances
are not technologically feasible management of
water resources is dependent on symptomatic
treatment. Algal genera which become an
economic nuisance are the blue-green, a few filamentious green algae, and Chara. Algae control on
Wisconsin recreational waters is practiced only
with copper sulfate. Higher plants—free floating,
emergents, submergents, and floating-leaved—are
controlled by commercial cutting equipment now
available and requires substantial technical and
operational support so that these operations are
usually feasible only when underwritten by a municipality or strong cooperative agency. Four herusually feasible only when underwritten by a mu-nicipality or strong cooperative agency. Four her-bicides are currently registered for general super-vised use on Wisconsin recreational waters: 2,4-D, Silvex (2,4,5-TP), diguat, and Aquathol. Mechani-cal control techniques with current equipment available are most readily utilized in combination with chemical control methods. Forty-eight lakes with chemical control methods. Forty-eight lakes have received some type of control for organisms causing swimmers' itch. An Interdisciplinary Advisory Committee functions in supervising aquatic nuisance control activities in Wisconsin before a product is used it must be registed by the Environental Protection Agency, Wisconsin Department of Agriculture, and must be approved by the Advisory Committee. (Jones-Wisconsin) W73-07193 SPECIAL FLOOD HAZARD INFORMATION REPORT, MUD CREEK, BROKEN BOW, NEBRASKA. Army Engineer District, Omaha, Nebr.

October 1972. 17 p, 8 fig, 4 plate, 2 tab.

Descriptors: *Floods, *Flood damage, *Flood protection, *Flood recurrence interval, *Nebraska, Streamflow, Flow characteristics, Peak discharge, Flood data, Flood plains, Channel improvement, Hydrologic data, Engineering, Projections, Hydrologic data, Engineering, Projections, Evaluation. Identifiers: *Broken Bow (Nebr), Mud Creek (Nebr), Standard project flood, Intermediate re-

gional Hood.

Broken Bow, Nebr., has a history of destructive flooding by Mud Creek overflow. A channel improvement project was authorized for construction by the Army Corps of Engineers beginning in 1972. The project, when completed, will reduce future flood damages by about 97%. Recognizing that complete protection cannot be economically provided, city officials have requested, through the Nebraska State Water Resources Commission, that this report be prepared to define the remaining flood threat. The basin and stream characteristics, flood histories, and the probable effects of major flooding in excess of the project channel capacity are described. Two potential floods, the Intermediate Regional and Standard Project Floods, are used to define the remaining flood threat. Discharges in excess of 1,200 cubic feet per second cause Mud Creek to overflow its banks in the Broken Bow area. Thirty-one floods occurred from 1945 through 1971. (Woodard-USGS) W73-07279

INTERCEPTION AND PHYTOMORPHOLOGY REPORT ON PROJECT HO/HY/6 AND HO/HY/7,

Moinstry of Works, Wellington (New Zealand). Water and Soil Conservation Div. G. J. Blake. Hydrological Research Progress Report No 9, 1972. 27 p, 23 fig, 2 tab, 17 ref.

Descriptors: "Vegetation, "Rainfall, "Interception, Throughfall, "Phytometers, Foreign countries, Trees, Grasses, Methodology, Topography, Streamflow, Water balance, Water levels, Turf, Soil-water-plant relationships." Identifiers: "New Zealand.

Identifiers: *New Zealand.

The purpose was to obtain a range of rainfall interception data for New Zealand vegetation and to explain differences by using vegetation form data or the phytomorphology of the various vegetation types. The variety of vegetation types throughout New Zealand makes it impossible to sample every type. Seven associations were selected at various localities throughout New Zealand: (1) Native forest-kauri (Agathis australis), Trounson Kauri Park, Northland; (2) Exotic forest-pine (Pinus radiato), Whakarewarewa forest, N. Z. Forest Service, Rotorua; (3) Regenerating hardwood/soft-wood-(Coprosma australis, Neopanax arboreum, Pittosporum tenuifolium), Otutira experimental basin, Lake Taupo; (4) Regenerating hardwood-manuka (Leptospermum scoparium), Puketurna experimental basin, Northland; (5) Exotic scrubgorse (Ulex europaeus), Moutere experimental basin, Nelson; (6) Native grasses and herbaceous species- (Chionochloa and fescue spp.), DSIR, Twin Stream, Canterbury; and (7) Exotic pasture grasses-perennial rye (Lolium perenne), Dairy Flat, Auckland and Makara experimental basin, Wellington, Ideally, sites for sampling both interception and phytomorphology should be in experimental basins so that the data may be used in water balance and energy balance studies. The phytomorphology of the forest sites is best studied in the field, while the grasses and herbs can be analyzed from samples transferred to the laboratory. (Woodard-USGS)

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

PRELIMINARY EVALUATION OF INFILTRA-TRELIBINATE HE MIAMA CANAL TO WELL FIELDS IN THE MIAMI SPRINGS-HIALEAH AREA, DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla.

F. W. Meyer. Geological Survey, Open File Report 72027, 1972. 85 p, 22 fig, 1 tab, 15 ref.

Descriptors: *Florida, Canals, Groundwater, *Canal seepage, *Infiltration, Groundwater move-ment, Groundwater recharge, Water wells, Pump-ing, *Saline water intrusion, Chlorides, Water quality, Sea water. Identifiers: Well fields, Cone of depression.

Infiltration from controlled canals minimizes the depth and extent of the cone of depression about the well fields in the Miami Springs-Hialeah area and prevents sea-water intrusion. In the 1940's the controlled canals contributed 78 to 100 percent of the dry-season pumpage. Average pumpage has in-creased from 67 to 92 million gallons per day dur-ing 1961-71 without significantly affecting the quality of well-field water. Water demands since quality of well-field water. Water demands since 1961 have caused the cone of depression to expand beyond the limits of the recharging canals; therefore, the percentage of dry-season contribution from the canals has decreased. In April 1971, the cone of depression expanded southward and caused deep salty groundwater in the vicinity of the Tamiami Canal to move northward beneath the airport toward the well fields, forcing a reduction in pumpage. A temporary dam was installed in the Tamiami Canal in September 1971 as a stopgap measure to minimize the threat of sea-water intrusion (Smith, NBWA) nith-NWWA) W73-07362

MATHEMATICAL MODEL OF ANNUAL RU-NOFF FLUCTUATIONS FOR HYDROLOGIC AND WATER-MANAGEMENT CALCULA-TIONS.

D. Y. Ratkovich

Hydrotechnical Construction, Translated for the ASCE, No 3, p 237-244, March, 1972. 4 fig, 1 tab, 11 ref. (Trans. from Gidrotekhnicheskoe Stroitelistuo, No 3, p 20-25, March 1972).

Descriptors: "Water management (Applied), "Stochastic processes, "Probability, "Runoff, Annual, Fluctuations, Reservoirs, Storage capacity, Water yield, Design, Streamflow, Bodies of water, Discharge (Water), Markov processes, Mathematical models. Identifiers: Calculations

The following stochastic models are considered from the standpoint of their suitability for describ-ing the regularities of the fluctuations of annual ruing the regularities of the fluctuations of annual ru-noff: Model I, a sequence of independent random variables; model II, the correlation between nor-mally distributed random variables with sub-sequent transition to gamma-distributed variables; model III, the correlation between the gamma-dis-tributed random variables; model IV, the correlation between the gamma-distributed random varia bles with the use of the normal distribution ap-paratus, which is the basis for the known nomograms, subsequently expanded; and model V, the correlation between the uniformly distributed rancontenuou octween the uniformly distributed ran-dom variables (frequencies of the gamma-dis-tributed variables). The practical value of a stochastic model of annual runoff fluctuation is not limited to nomograms for determining the storage capacity of reservoirs. The model permits constructing an artifical series of annual runoff, constructing an artificial series of annual runori, which offers many opportunities for investigating the regime of water-management installations for annual streamflow control and of bodies of water. Criteria can be worked out for a model for determining the representativeness of the observed runoff series, and also the probability of a particular unfavorable runoff situation. (Bell-Cornell)

CAPITAL-COST MINIMIZATION OF HYDRAU-LIC NETWORK, Technische Hoch

schule, Karlsruhe (West Gerneconstene rioconsenule, Karistune (west Germany). Institut fur Siedlungswasserwirtschaft. R. G. Cembrowicz, and J. J. Harrington. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Proceedings paper, No 9606, p 431-440, March 1973. 2 fig, 1 tab, 17 equ, 15 ref, 2 append.

Descriptors: *Capital costs, *Distribution systems, *Water distribution (Applied), Hydraulics, *Optimization, Water supply, Systems analysis, Mathematical models, Algorithms, *Networks. Identifiers: Network analysis.

Water distribution systems involve considerable capital costs. One basic analysis is to minimize the cost for a deterministic load pattern. A method is presented to determine the global minimum of the capital costs for continuous diameters. Using fundamental great theory, the original presentation. capital costs for continuous diameters. Using fun-damental graph theory the original nonconvex problem is decomposed into independent sets of convex functions subject to linear constraints. Standard algorithms are available to solve the transformed version. The nonconvex capital cost function of a hydraulic network has been trans-formed to subsets of nonlinear convex functions by a decomposition principle from graph theory.
The variables are the flows and head losses in each pipe and the constraints are linear expressions of the head losses. The global minimum cost solution the nead losses. In g goods in minimum cost solution follows using a standard nonlinear programming algorithm. Further research is suggested to investigate the impact of multiple load patterns upon the optimal tree choice and to devise more the optimal tree choice and to devise more regiorous methods for recognizing, a priori, trees that lead to higher cost. The analysis herein is equally applicable to a sewer system provided that the hydraulic radius and cross-sectional area can be expressed as a single-term function of the radius (Bell-Cornell) s. (Bell-Cornell) W73-07370

OPTIMIZING PORTS THROUGH COMPUTER SIMULATION SENSITIVITY ANALYSIS OF PERTINENT PARAMETERS, Technical Univ. of Denmark, Copenhagen.

Coastal Engineering Lab. J. B. Hansen.

Operational Research Quarterly, Vol 23, No 4, p 519-530, December, 1972. 1 fig, 5 tab, 18 ref, ap-

Descriptors: *Harbors, *Size, *Optimization, *Simulation analysis, Equipment, Costs, Economics, Ships, Cranes, Computers, Mathe-matical models, Systems analysis. Identifiers: *Sea ports, Quay length, Berths, Capacities, Sensitivity analysis.

Most important in determining port size are the characteristics of the traffic which the harbor serves. Analysis is made of the importance of a serves. Analysis is made of the importance of a number of parameters that influence the economically optimum size of a sea port. The combined influence of quay length—as distinct from number of berths—and the total capacity of the cargo handling equipment, expressed as the number of cranes, is studied. The reliability of optimization results is discussed based on their sensitivity to variations in the distributions of ship sizes and crane capacities. Simulation results show that both ship size and crane capacities of the size of the state of the size o crane capacity distributions have little significance within certain (wide) ranges; also, flexible berths, which gave a reduction of 10-15 percent in length of quay, yield a decrease in total systems costs. The optimum number of cranes depends on the particular terminal but, in general, for bulk cargo particular terminal but, in general, for our cargo terminals, where all cargo is handled by low capacity quay cranes, the number of cranes should at most be equal to the average number utilized when the quay is fully occupied. (Bell-Cornell) W73-07374

LEAST COST PIPE NETWORK DERIVATION. University Coll., London (England). Dept. of Civil and Municipal Engineering.

A. K. Deb.

Water and Water Engineering, Vol 77, No 923, p 18-21, January, 1973. 2 fig, 32 equ, 3 ref.

Descriptors: "Water supply, "Distribution systems, Hydraulics, "Networks, "Pipelines," Costs, "Optimization, Equations, Mathematical models, Systems analysis, Flow, Pressure, Com-Identifiers: *Network analysis, Nodal heads

The main function of a water distribution system is to transport adequate quantities of water from the source or treatment works to the consumers source or treatment works to the consumers without degrading its quality, keeping a minimum residual pressure through a network of pipelines; included are many hydraulic elements, such as storage reservoir and pumps, etc. The distribution system forms a large portion of the total cost of the water supply scheme, and so the need for its economical analysis and design is obvious. Formulations are supply scheme, and so the need for its economical analysis and design is obvious. Formulations are supply scheme, and so the need for its economical analysis and design is obvious. Formulations are supply scheme. lated is a new method of hydraulic network analy lated is a new method of hydraulic network analysis that incorporates pipe cost function, based on an equivalent diameter concept from which the minimum cost solution of a pipe network may be obtained for a particular set of nodal head values. In this method, all pipes of the network are replaced by equal lengths of equivalent diameter pipes. Combining the Hazen-Williams equation for pipe flow with the cost function of pipes, a criterion is developed which when satisfied in each loop of the network would produce the workable optimum solution of the network. Using this method necessitates a high sneed digital computer. ethod necessitates a high speed digital computer. (Bell-Cornell)

HYDROLOGICAL RESERVOIR DESIGN USING

BASIC SYSTEMS THEORY TECHNIQUES, Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany). F. Fahlbusch, F. G. Rohde, and T. C. Muir. Water Power (The International Journal for Hydroelectric Development), Vol 25, No 1, p 18-24, January, 1973. 7 fig, 1 tab, 23 equ, 19 ref.

Descriptors: "Reservoir design, "Storage capaci-ty, "Hydrologic models, "Rainfall-runoff relation-ships, "Risks, "Time series analysis, Simulation analysis, Reservoir operation, Optimum develop-ment plans, Water resources, Engineering, Comouter programs, Mathematical models, Systems nalysis, Stochastic processes.

A fundamental task in water resources engineering is selection of the optimal capacity of a single or multipurpose regulating reservoir. Basic information required for the economic analysis of a proposed scheme includes the relationship between target draft (reflecting benefits) and associated reservoir capacity (reflecting costs). The determination of this relationship has traditionally been attempted using historical records of runoff and the mass curve technique of Ripul However. been attempted using historical records of runoff and the mass curve technique of Rippl. However, use of historical records alone provides basically no idea of the risks involved; the concept of risk is an indispensible element in reliable design. Presented in relatively simple terms is an approach to solving the problem of designing adequate reservoir storage capacity given a lengthy record of monthly rainfall and a short record of monthly rainfall and a short record of monthly rainfall and a short record of monthly short. The procedure is one of routing a stochastically generated precipitation series through a deterministic watershed model. The three principal components of the method are: (1) A monthly rainfall-runoff model; (2) time series analysis of the observed monthly rainfall sequence, synthesis of a long rainfall series; and (3) simulation of the reservoir operation. The mathematical procedure is described in detail and conclusions are discussed. (Bell-Cornell) FLOODS IN MARENGO SOUTH QUADRAN-GLE, NORTHEASTERN ILLINOIS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-07384

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FLOODS IN HAMPSHIRE QUADRANGLE, NORTHEASTERN ILLINOIS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-07385

RECENT WATER RESOURCES DEVELOP-MENT IN TAIWAN, REPUBLIC OF CHINA, Taiwan Power Co., Taipei. D. S. L. Chu.

Report, January 1973. 6 p, 1 fig, 3 photo, 3 tab.

Descriptors: *Water resources development, *Land development, *Water demand, Hydrologic data, Foreign countries, Surface waters, Rainfall, Reservoirs, Urbanization, Industries, Water pollution sources, Water supply, Projections, Economic impact, Population, Water users, Water utilization, Irrigation, Flood control, Recreation. Identifiers: *Taiwan (Republic of China).

The rapid economic growth on the island of Taiwan, Republic of China, has stimulated the further development of water and related land resources on a coordinated basis. In 1966, there were 138 gaging stations and 1,081 rainfall stations. In more recent years, emphasis has been put on the redistribution of the stations, the renewal of equipment and improvement in method of observation. There are three multipurpose reservoirs in operation and under construction in Taiwan. The main functions of the reservoirs are irrigation, flood control, public water supply, power, recreation, fish and wild life conservation. The industrial water consumptions were 149 million and 807 million cubic meters in 1964 and 1970, respectively, an increase of 5.4 times in only six years. The estimated of the state an increase of 5.4 times in only six years. The esti-mated demands of industrial water supply are 1,281 million and 1,920 million cubic meters for 1980 and 1990, respectively. Urbanization and industrial activities have caused turbidity in some streams to exceed 10,000 ppm. (Woodard-USGS) W73-07390

SPECIAL FLOOD HAZARD INFORMATION REPORT, BEAVER CREEK, ST. EDWARD, NEBRASKA.

Army Engineer District, Omaha, Neb. For primary bibliographic entry see Field 02E. W73-07392

STATISTICAL GEOMETRIC SIMILARITY IN

DRAINAGE NETWORKS,
Thomas J. Watson Research Center, Yorktown
Heights, N. Y.

J. S. Smart.

Available from the National Technical Informa-tion Service as AD 745 785 \$3.00 in paper copy, \$0.95 in microfiche. IBM Research Report RC 3850, May 15, 1972. 30 p. 7 fig, 15 ref. ONR-GP Contract N00014-70-C-0188.

Descriptors: *Channel morphology, *Drainage area, *River basins, *Geomorphology, Correlation analysis, Hydrologic data, Networks, Analytical techniques, Streamflow, Hydraulics, Forecasting, Statistical methods, Streams.

Identifiers: Geometric similarity.

Distinguishing and characterizing basin drainage network structure from the standpoint of geometric similarity is described. Pairs of networks were selected for study and comparison from each of six different geographical regions. The most commonly used quantitative parameters for characterizing channel networks are those derived from a Horton analysis (bifurcation ratios, stream length

ratios, etc.). Although these parameters give useful information about individual networks, they are generally ineffective in distinguishing diferences in network structure due to lithologic controls and degree of maturity. This failure is in part due to the random nature of network topology and link lengths and in part due to the fact that the Horton analysis tends to average out many of the details that characterize such differences. Parameters derived from considerations of statistical geometric similarity, on the other hand, are relatively successful in characterizing network structure. (Woodard-USGS)

AN INVENTORY AND EVALUATION OF THE GAME AND FISH RESOURCES OF THE UPPER GREENRIVER IN RELATION TO CURRENT AND PROPOSED WATER DEVELOPMENT PROGRAMS, Wyoming Univ., Laramie. Dept. of Zoology and Physiology. For primary bibliographic entry see Field 06B. W73-07426

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

For primary bibliographic entry see Field 06A. W73-07428

FURTHER DEVELOPMENT OF THE IMPLICIT DIFFERENCE SCHEME FOR FLOOD WAVE CALCULATION,
Technische Hogeschool, Delft (Netherlands).
For primary bibliographic entry see Field 02E.
W73-07526

THE INFLUENCE OF VALLEY GRAVELS ON THE MOVEMENT OF A FLOOD WAVE, Hydraulics Research Station, Wallingford (En-

For primary bibliographic entry see Field 02J. W73-07525 gland). For prin

A MODEL FOR FLOOD COMPUTATIONS IN THE PARANA AREA, M. H. Gradowczk, and L. Ivanissevich. In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 199-204, 1972 (release date). 4 fig, 3 ref.

Descriptors: *Flood forecasting, *Flood waves, *Mathematical models, South America, Flood plains, Deltas, Flood protection, Planning, Levees, Channel morphology.

Identifiers: *Parana (Argentina).

A one-dimensional hydrodynamic mathematical model forecasts the propagation of floods over the flood plains and delta of the Parana River, Argentina. The model not only describes the natural regime but was used to design a levee surrounding an island of 550 sq km. The model was based on the following assumptions: (a) flood and wind-wave propagation were described by one-dimensional flow theory; (b) the geometry of the river cross section was simplified according to available attimetry; and (c) the mobility of the bed might be disregarded during flood periods. (Knapp-USGS) W73-07527.

STOCHASTIC ANALYSIS OF HYDROLOGIC

SYSTEMS, Illinois Univ., Urbana. Hydrosystems Lab. For primary bibliographic entry see Field 02A. W73-07532

UTILISATION AND TAXONOMY OF THE DESERT GRASS PANICUM TURCIDUM, Birmingham Univ. (England). Dept. of Botany. For primary bibliographic entry see Field 03F. W73-07648

CONTROL OF MESQUITE, University of the Panjab, Lahore (Pakistan). Dept. of Chemistry. For primary bibliographic entry see Field 03B. W73-07653

DRAINAGE OF AGRICULTURAL LAND, A PRACTICAL HANDBOOK FOR THE PLANNING, DESIGN, CONSTRUCTION AND MAINTENANCE OF AGRICULTURAL DRAINAGE SYSTEMS. Soil Conservation Service, Washington, D.C.

Water Information Center, Inc., Port Washington N.Y. 1973. 430 p, \$7.95.

Descriptors: "Publications, "Agriculture, "Land reclamation, "Drainage engineering, "Subsurface drainage, "Surface drainage, "Dikes, "Pumping, Drainage effects, Soil conservation, Soil management, Leaching, Ponding, Channeling, Drainage practices, Drainage systems, Water management (Applied), Management, Technical writing, Arable lands, "Agricultural engineering.

The text is a reproduction of Section 16, entitled 'Drainage of Agricultural Land', from the National Engineering Handbook issued in 1971 by the Soil Conservation Service. The publisher has added an index. Reproduction of this comprehensive material was undertaken to make it available to persons and organizations interested in the management of water resources. The handbook is intended for use in all 50 states and the Caribbean area, so it is rather general in many respects. For use in a specific area, it should be supplemented with data on soils, climate, topography, and land use applicable to the area. Nien chapters are included with the following headings: (1) Principles of Drainage, (2) Drainage Investigations, (3) Surface Drainage, (4) Subsurface Drainage, (5) Open Ditches for Drainage Design, Construction and Maintenance, (6) Dikes, (7) Drainage Pumping, (8) Drainage of Organic Soils, (9) Drainage of Tidal Lands. (Black-Arizona) W73-07658

PROBABILITY FORECASTS OF WATER SUR-FACE TEMPERATURES OF THE ST. LAWRENCE RIVER BETWEEN KINGSTON, ONTARIO AND SOREL, QUEBEC, Department of Fisheries and Forestry, Cornwall (Ontario). Water Planning and Operations Branch. R. Y. Poulin, J. R. Robinson, and D. F. Withersnoot

Witherspoon.
In: Proceedings of the 28th Annual Eastern Snow Conference, February 4-5, 1971, Fredericton, N. B., Canada: Eastern Snow Conference Publica-tion, Vol 16, p 33-48, 1971. 7 fig, 6 tab, 4 ref.

Descriptors: "Water temperature, "Remote sensing, "Freezing, "St. Lawrence River, Mathematical models, Computer programs, Navigation, Temperature, Radiation, Thermal radiation. Identifiers: "River ice forecasting, Airborne

Useful forecasts may be made of water surface temperatures, from which freeze-up dates on the St. Lawrence River can be inferred. The airborne radiation thermometer (ART) provides economical data of the temperature of the river. Monthly forecasts of levels and flows are combined with the ART data and forecasts of air temperature to provide data for forecasting water surface temperatures. For purposes of these calculations, the river between Kingston and Cornwall is divided into 73 sections. Water surface areas, water-velocities, cross-sectional areas, and average

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Group 4A-Control of Water on the Surface

depths are determined for each section. Daily mean air temperatures are obtained from meteorological stations. A computer program yields water surface temperatures at each section using the ART data for the initial state. Computed water temperatures are compared with the ART measurement at the section where the time coincident water temperatures are compared with the ART measurement at the section where the time coincident water temperatures are compared to the contract of cides with the observation time to estimate a cooling coefficient for a model to simulate the water mg coefficient for a model to simulate the water surface temperature. The most suitable cooling coefficient for the Kingston to Cornwall reach of the river was determined to be 96 BTU per sq ft per deg F per day. (Knapp-USGS) W73-07661

PROBLEMS IN THE STUDY AND UTILIZA-TION OF WATER RESOURCES (PROBLEMY IZUCHENIYA I ISPOL'ZOVANIYA VODNYKH RESURSOV).

Izdatel'stvo 'Nauka', Moscow, S. N. Kritskiy, and M. F. Menkel', editors, 1972. 160 p.

Descriptors: "Water resources, "Water resources development, "Water utilization, Water conservation, Water supply, Water management (Applied), Water distribution (Applied), Water allocation (Policy), Multiple-purpose reservoirs, Reservoir construction, Reservoir operation, Regulation, Streamflow, Hydrologic cycle, Water balance, Runoff, Isotope studies, Dynamic programming, Optimization.

Optimization.
Identifiers: *USSR, Global hydrology, Continental hydrology.

This collection is the first in a series of papers published by the USSR Academy of Sciences In-stitute of Water Problems, founded recently for stitute of Water Problems, founded recently for evaluation and optimum development of the country's water resources. The collection contains six papers devoted to various aspects of water-resources investigations: (1) problems in continenal hydrology (G. P. Kalinin); (2) problems in regulation of streamflow (D. V. Korenistov, S. N. Kritskiy, M. F. Menkel'); (3) basic directions in the construction and multiple use of reservoir. skiy, M. F. Menkel'); (3) basic directions in the construction and multiple use of reservoirs (A. B. Avakyan, V. A. Sharapov); (4) the dynamic programming approach to optimal distribution of water resources (A. L. Velikanov, D. N. Korobova); (5) practical application of tritium, deuterium, and oxygen-18 to solution of hydrologic problems (V. N. Soyfer, V. S. Brezgunov, V. V. Romanov, V. G. Onufriyev, L. S. Vlasova, I. K. Morkowkinsh, and (6) was of deuterium tritium. Morkovkina); and (6) use of deuterium, tritium, and oxygen-18 in investigations of natural waters in the global hydrologic cycle (V. N. Soyfer, Ye. N. Davydov, V. A. Petrukhin, V. V. Romanov). (Josefson-USGS)

SOUTH DAKOTA FLOOD DISASTER. For primary bibliographic entry see Field 06E. W73-07702

OMNIBUS WATER RESOURCES AUTHORIZA-TIONS-1972, PART 2.
For primary bibliographic entry see Field 06E.
W73-07704

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO, PART II. For primary bibliographic entry see Field 06E. W73-07706

WATERWAYS, DRAINAGE, FLOOD CONTROL, WATER FOLLUTION AND WATER RESOURCES STUDY COMMISSION; WATER For primary bibliographic entry see Field 06E.

AQUATIC PLANT CONTROL PROGRAM, TECHNICAL REPORT 1, CONTROLLED-RELEASE HERBICIDES. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Sponsored by Office, Chief of Engineers, U.S. Army. October, 1972. 136 p., 4 append.

Descriptors: *Aquatic weed control, *Herbicides, *Environmental effects.

Research studies (1968 through 1972) summarized herein were initiated to (a) minimize the amount of herbicide necessary for efficacious control, (b) maximize the treatment application for a specific target species, and (c) modify the system application for more complete control of the target species. Even though these goals were not fully achieved, substantial progress was made. The research studies were conducted by the Agricultural Research Center, Fort Lauderdale, Fla.; Army Environmental Hygiene Agency, Edgewood Arsenal, Aberdeen Proving Ground, Md.; Creative Biology Laboratory, University of Akron, Akron, Ohio; and University of Southwestern Louisiana, Lafayette, La. (WES)

INTER-FIELD TREE BELTS AND PRECIPITA-TION IN NEIGHBORING AREAS, Polskie Towarzystwo Przyrodnikow im. Kopernika, Warsaw A. Kaminski.

Wszechswiat. 3. 69. 1971.

Identifiers: Distribution, Moisture, *Precipitation, Rainfall, Soils, *Tree belts, Wind.

Inter-field tree belts change conditions of the en-vironment, especially their influence on both horizontal and vertical wind conditions. Inter-field tree belts in the Wielkopolska area exert a noticea-ble influence on rainfall distribution and increase soil water moisture by 6-12% on neighborin fields.—Copyright 1972, Biological Abstracts, Inc. W73-07792

4B. Groundwater Management

A HYDROGEOLOGIC INVESTIGATION OF THE LEE FARM AREA, SOUTH COVENTRY, CONNECTICUT, Connecticut Univ., Storrs. Inst. of Water J. N. Fischer.

M Sc Thesis, 1972, 67 p, 12 tab, 24 plates, 11 ref, 1append. OWRR-A-005-CONN (2). 14-01-0001-1626.

Descriptors: "Hydrology, "Hydrologic aspects, "Glacial aquifers, "Glacial sediments, Sediment sorting, Particle size, "Connecticut, Transmissivity, Storage coefficient. Identifiers: "Well fields, "Kame Terrace, "Valley field Sharemann Markets". field, Skungamaug valley.

The characteristics of sediments in two well fields were examined to determine the aquifer capabilities of each. The well fields are located in the Lee Farm area, South Coventry, Connecticut, one in a kame terrace and the other in the valley field. Subsurface data indicated that both well field areas surface data indicated that both well field areas consist generally of layers of poorly sorted sediments complicated by lenses having a different mean phi grain size than the inclusive or adjacent layer. The sorting of materials in the valley field is better than in the kame terrace. The predominant petter than in the Rame terrace. The predominant grain size for the kame terrace is coarse sand (0 phi to 1 phi) while grain sizes for the valley field are very coarse and coarse sand (-1 phi to 1 phi) and very fine sand (3 phi to 4 phi). Pump tests and Walton's leaky curves revealed an average transmissibility for the kame terrace of 220.99 gpd/ft. and an average storage coefficient of .00878. Investigations of the hydrologic properties of the valley field resulted in values of 200 gpd/ft. and .0012 for the coefficients of transmissibility and storage respectively. The above data led to the conclusion that the hydrogeologic properties of these two well fields were not significantly different despite their dissimilar textures.

W73-07167

INFLUENCE OF FERTILIZATION AND CROPS ON NITRATE CONTENT OF GROUNDWATER AND TILE DRAINAGE EFFLUENT,

Clemson Univ., S.C. Dept. of Agronomy and

For primary bibliographic entry see Field 05B. W73-07173

PHYTOINDICATION OF CERTAIN HYDROLOGICAL AND GEODYNAMIC CONDI-TIONS OF TAKYRS IN THE UST URT DESERT, (IN RUSSIAN),
For primary bibliographic entry see Field 03B.

URBAN INFLUENCES UPON GROUNDWATER CCONDITIONS IN THAMES FLOOD PLAIN DEPOSITS OF CENTRAL LONDON,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 04C.
W73-07239

GROUNDWATER LEVELS AND PUMPAGE IN THE EAST ST. LOUIS AREA, ILLINOIS, 1967-

-1971, Illinois State Water Survey, Urbana

W. H. Baker, Jr. Illinois Water Survey Circular 112, 1972. 29 p, 17 fig, 4 tab, 5 ref, append.

Descriptors: *Groundwater resources, *Water wells, *Pumping, *Water levels, *Illinois, Aquifers, Aquifer characteristics, Hydrogeology, Water yield, Water level fluctuations, Withdrawal, Water utilization, Drawdown, Groundwater move-ment, Groundwater recharge, Hydrologic data, Basic data collections.

Groundwater levels and pumpage in the East St. Louis area, Illinois from 1967 through 1971 are summarized. Large quantities of groundwater chiefly for industrial and municipal use are chiefly for industrial and municipal use are withdrawn from wells penetrating a sand and gravel aquifer along the valley lowlands of the Mississippi River. Groundwater pumpage decreased from 108.1 mgd in 1966 to 79.5 mgd in 1971. Of the total 1971 pumpage, 86.5% was industrial; 9.7% was for public water supplies; 3.0% was for domestic use; and 0.8% was for irrigation. Pumpage is concentrated in five major pumping centers: the Alton, Wood River, Granite City, Nacenters: the Alton, Wood River, Granite City, Na-tional City, and Monsanto areas. As the result of reduced pumpage, near normal precipitation, and high Mississippi River stages, water levels rose 25 feet in the Monsanto area near the Mississippi River, 5 feet in the National City area, and 10 feet in the Granite City area. Water levels in the Wood River area declined 15 feet in one area and rose 10 feet in another area as the center of pumping moved because of an increase and shift in pump-ing. Water levels in the Alton area declined 20 feet in one area as a result of a shift in the center of pumpage. (Woodard-USGS) W73-07253

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1969-1970, Geological Survey, Oklahoma City, Okla. R. L. Moore.

pical Survey Open-file Report, 1972. 86 p, 2

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Groundwater Management—Group 4B

Descriptors: *Groundwater, *Water levels, *Ob servation wells, *Water wells, *Oklahoma, Well data, Depth, Aquifer characteristics, Water level fluctuations, Basic data collections, Groundwater

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p. 2

The basic observation-well network in Oklahoma during the period 1969-1970 included the following counties: Alfalfa, Beaver, Beckham, Caddo, Cimarron, Cleveland, Garfield, Garvin, Grady, Greer, Harmon, Jackson, Kingfisher, Le Flore, Major, Muskogee, Oklahoma, Payne, Pontotoc, Rogers, Sequoyah, Texas, Tillman, Wagoner, Washita, and Woodward. Data are tabulated for the basic Observation, well network and other wife the basic observation-well network and other wells measured by the U.S. Geological Survey. Informa-tion for each well includes well number, well locanon for each wei includes weil number, weil forca-tion, depth, land-surface datum, aquifer or water-bearing formation, highest water level measured and date, lowest water level measured and date, and period of record during which measurements were made. (Woodard-USGS) W73-07254

PRELIMINARY REPORT ON THE WATER RESOURCES OF CENTRAL MAUI, HAWAII, Geological Survey, Honolulu, Hawaii. K. J. Takasaki.

Hawaii Division of Water and Land Development Circular C62, August 1972. 80 p. 37 fig, 5 tab, 16

Descriptors: "Water resources, "Groundwater, "Surface waters, "Water yield, "Hawaii, Well data, Water utilization, Irrigation, Sugarcane, Pumping, Water quality, Water level fluctuations, Aquifer characteristics, Groundwater movement, Rainfall-runoff relationships, Ephemeral streams, Groundwater recharge, Water supply, Hydrologic data Identifiers: *Mani (Hawaii)

Central Maui, Hawaii, is about 270 squ area and comprises the west slopes of Haleakala and the isthmus, which lies between east and west and the isthmus, which lies between east and west Maui. The principal industry is sugarcane cultivation. Streamflow depends mostly on intensity and
persistency of rainfall and is perennial only in the
wet eastern part. Elsewhere, the streams are
ephemeral. The quality of water in perennial
streams and in perched-water bodies is excellent. Sea-water contamination of basal groundwater is more pronounced in the dry Kihei-Makena area more pronounced in the dry Kihei-Makena area than in the wetter Honopou to Mailko area. In the southern part of the Kihei-Makena area, a significant supply of basal water in the chlorinity range of 500 to 1,000 mg/liter is available within a mile from shore, at altitudes up to about 400 feet. Three wells in Wailea, im 1971, were pumped at a rate equivalent to a discharge of about 1 mgd permile of coastline. After an initial rise in chlorinity from about 600 to 200 mg/liter the chlorinity appeared to about 600 to 700 mg/liter the chlorinity appeared to hold at this level while the pumping rate was maintained. (Woodard-USGS)

EFFECTIVENESS OF SUBSURFACE FILTRA-TION BEDS WITH RESPECT TO SALMONEL-LAS, Kiev Research Inst. of General Communal Hy-

giene (USSR).
For primary bibliographic entry see Field 05D.
W73-07284

SIMPLIFIED TECHNIQUES FOR DETERMINA-TION OF THE SIZE OF SANITARY ZONES
AROUND INTAKES OF SUBSURFACE
WATERS,

Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Environmental Hygiene. For primary bibliographic entry see Field 05B.

SURVIVAL OF DYSENTERY PATHOGENS IN WELL WATER,
For primary bibliographic entry see Field 05B.
W73-07301

ON THE USE OF SODIUM BICARBONATE WATERS AS DRINKING WATER, Novosibirsk Public Health Research Inst. (USSR). For primary bibliographic entry see Field 05C. W73-0731!

HYGIENIC EVALUATION OF ARTESIAN WATERS USED FOR UTILITY AND DRINKING WATER SUPPLY IN THE TERRESULAK LOWLAND,
Dagestanskii Meditsinskii Institut, Makhachkala

(USSR). For primary bibliographic entry see Field 05A. W73-07312

GROUNDWATER ZONING IN WATER RESOURCES MANAGEMENT, Wisconsin Univ., Madison. Dept. of Geology and Geophysics. A. Zaporozec. Water Resources Bulletin, Vol 8, No 6, p 1137-1143, December 1972. 2 fig, 5 ref.

Descriptors: Groundwater resources, Groundwater, Groundwater availability, Hydrogeology, *Regional analysis, *Zoning, Water resources, Management, Regions, Recharge, *Hydrologic systems, Hydrology, Classification.
Identifiers: Hydrogeological units, *Groundwater

The concept of groundwater zoning in relation to hydrogeological regionalization is discussed. This concept has been recently used in several planning studies in the United States, and has proven to be a useful tool in long range state planning programs in Russia and Europe. Regional zoning means the classification of given regions with regard to hydrogeological characteristics and the evaluation of the possible uses of each zone. The necessary assumptions are the appropriate knowledge of geological structure (compiled in a geological map) and of hydrogeological conditions (compiled in a hydrogeological unit distinguished and delineated on the basis of lithological, structural, and hydrogeological characteristics. Regions are also grouped into larger units: hydrogeological provinces and realms. The subdivision of regions into hydrogeological zones, or subzones when applicable, forms the basis for a groundwater development plan. (Campbell-NWWA) NWWA)

WATER WELL STANDARDS: STATE OF CALIFORNIA.
California State Dept. of Water Resources, Sacra-

For primary bibliographic entry see Field 08A. W73-07337

STANDARDS FOR CONSTRUCTION OF PRIVATE WATER WELLS. Indiana State Board of Health, Indianapolis. For primary bibliographic entry see Field 08A. W73-07338

GROUND WATER QUALITY CONTROL. Michigan Dept. of Public Health, Lansing. For primary bibliographic entry see Field 05G. W73-07339

RURAL WATER SUPPLY.
New York State Dept. of Health, Albany.

1966, 66 P. 15 FIG. 5 TAB, 6 APPEND.

Descriptors: Wells, "Water wells, Sampling, Dis-infection, Well casings, "Well regulations, Well permits, Pollutants, Hardness (Water), Iron, Springs, Infiltration galleries, "Rural areas, Cisterns, Grouting, Bids, "Construction. Identifiers: Well contamination, Sanitary well seals, "Private water supply.

seals, *Private water supply.

The principles given represent widely accepted good practice in the building of a satisfactory ground water supply. It is emphasized that where a public water supply is available, an owner should make every effort to use it in preference to any other, since public water supplies are usually under competent management and routine health department supervision. In the absence of a public water supply, a well can normally be relied on to produce water of satisfactory quality if the well is properly located, constructed, and protected. Definitions of adequate water quality and quantity are given. Drilled wells are recommended over duy ewils or springs, since they are less likely to become contaminated and are a more dependable source. Driven wells, infiltration galleries, and cisterns are also mentioned. Well location and methods thereof are discussed in detail, including sections on overburden, well construction and well location, and sources of pollution. Bid analysis, well logging, water storage, casing, grouting, and sealing are covered under well construction. A chapter deals with well disinfection and causes of well contamination. Emergency water treatment, special problems, and sampling are discussed. (Smith-NWA)

RECOMMENDED STANDARDS FOR PREPARATION OF WATER WELL CONSTRUCTION SPECIFICATIONS. Associated Drilling Contractors, Sacramento, Calif. Specifications Committee. For primary bibliographic entry see Field 08A. W73-0734.

RULES AND REGULATIONS GOVERNING DRILLING OF WELLS AND APPROPRIATION AND USE OF GROUND WATER IN NEW MEX-New Mexico State Engineer, Santa Fe. For primary bibliographic entry see Field 08A. W73-07342

RECOMMENDED STANDARDS FOR PREPARATION OF WATER WELL CONSTRUCTION SPECIFICATIONS, Minnesota Water Well Association, St. Paul. For primary bibliographic entry see Field 08A. W73-07345

ARGE-SCALE GROUND-WATER DEVELOP-MENT. United Nations Water Resources Development

United Nations Publication Catalogue No 60.11.B.3, E/3424-ST/ECA/65, 1960. 84 p. Price

Descriptors: Groundwater, Wells, *Water wells, Arid lands, Groundwater availability, *Groundwater session to the water resources, Drilling, Surveys, Maintenance, *Economic feasibility, Financial feasibility, Administration, Legislation, Taxes, Water quality. Identifiers: United Nations, *Groundwater

In its resolution 675 (XXU) the Economic and Social Council requested the Secretary General of the United Nations to take appropriate measures for the establishment of a center to promote coordinated efforts for the development of water resources; groundwater problems were singled out

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 48—Groundwater Management

as one of the priority subjects in the development of a program of studies. The first of a series of studies undertaken by United Nations organizations participating in the activities of the United Nations Water Resources Development Center is described. Basic considerations relating to groundwater use are given, among them economic factors, availability, quality of groundwater in relation to use, allocation of groundwater in relation to use, allocation of groundwater use piles, allocation of groundwater, and social implications. Stages of groundwater development, economic and financial aspects, organization and administration, and groundwater legislation are also covered in some detail. (Campbell-NWWA)

SUBSURFACE WASTE STORAGE-THE EARTH SCIENTIST'S DILEMMA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05E. W73-07356

INJECTION WELLS AND OPERATIONS TODAY, Bureau of Mines, Bartlesville, Okla. For primary bibliographic entry see Field 05E. W73-07357

EMERGING TOOLS IN GROUNDWATER MANAGEMENT, California Univ., Los Angeles. Dept. of Systems Engineering.
W.W-G.Yeh.

In: Proceedings, Eighth Biennial Conference on Groundwater (Sept., 1971), University of California, Davis, Report No 24, edited by A. F. Pillsbury, April, 1972. 3 p, 96 ref.

Descriptors: "Groundwater, "Management, "Aquifers, "Conjunctive use, "Surface waters, "Bibliographies, Groundwater basins, Engineering, Reservoirs, Water supply, Storage, Optimization, Simulation analysis, Analog computers, Digital computers, Model studies, Operations research, Dynamic programming, Linear programming,

A detailed review of current engineering tools used in groundwater management is presented. Groundwater is an important source of water supply in semi-arid and arid regions. Simulation and mathematical models are used often in analyzing the conjunctive management of ground and surface water systems. Optimum development and management are achieved in most cases where pumping of groundwater is balanced by replenishment: This can be accomplished only through complete understanding of the groundwater basin. The worth of an aquifer as a fully developed source of groundwater supply depends on two inherent parameters: Its ability to store and to transmit water. Thus, the main problems in groundwater management have been to identify aquifer structures and parameters and then to optimize the management of the integrated groundwater basin. The optimization may include surface water reservoirs and any other available sources. (Bell-Cornell)

SYSTEMS ANALYSIS AND IRRIGATION PLANNING, Harvard Univ., Cambridge, Mass. Center for Population Studies. For primary bibliographic entry see Field 03F. W73-07378

RADIOCHEMICAL ANALYSES OF WATER SAMPLES COLLECTED AFTER THE SALMON EVENT IN THE VICINITY OF TATUM SALT DOME, LAMAR COUNTY, MISSISSIPPI, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05A. W73-07380

WATER LEVELS IN OBSERVATION WELLS IN THE TATUM SALT DOME AREA, 1961-45, LAMAR COUNTY, MISSISSIPPI, Geological Survey, Washington, D.C. R. E. Taylor. Available from NTIS, Springfield, Va 22151 USGS-474 118; Price \$3.00 printed copy; 95 cents microfiche. Geological Survey Report USGS-474-118 (Project Dribble-48), (N.D.). 42 p, 13 fig, 1 tab. (Release date 1972)

Descriptors: "Water level fluctuations, "Groundwater, "Observation wells, "Nuclear explosions, 'Mississippi, Underground, Aquifers, Hydrographs, Hydrologic data, Data collections, Evaluation, Pumping, Water wells, Well data. Identifiers: "Tatum salt dome area (Miss).

Since 1961 the U.S. Geological Survey has monitored water levels in 26 wells in 8 aquifers in the Tatum salt dome area, Lamar County, Mississippi. Hydrographs for the years 1961-65 depict water-level fluctuations during each well's observation period. Six of the eight aquifers are artesian and areal in extent; the salt dome interrupts two aquifers and part of another. The water level in the Cook Mountain Limestone, the deepest artesian aquifer monitored, has risen because of offsite oil-field brine injection. Water levels in the overlying fresh-water artesian aquifers declined, mainly in response to industrial and municipal pumpage. The surficial aquifer has seasonal water-level fluctuations and since 1961 has had a net decline. The 5-kiloton Salmon Event (underground nuclear explosion) had no measurable permanent effect on the water levels in the aquifers. The detonation had an immediate effect on water levels in certain wells, depending on the relation of the position of the aquifers to the shot-point. Since the October 22, 1964 underground test, the pumping and sampling program initiated on the test-site wells has resulted in local water-level declines. (See also W73-07380) (Woodard-USGS)

CHEMICAL QUALITY OF WATER IN CANO TIBURONES, PUERTO RICO: A RECONNAIS-SANCE STUDY CARRED OUT IN 1967, Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 07C. W73-07382

WATER WELL TECHNOLOGY, National Water Well Association, Columbus, Ohio. Research Facility. For primary bibliographic entry see Field 08A. W73-07416

EXPLORATION AND EXPLOITATION OF GEOTHERMAL RESOURCES IN ARID AND SEMIARID LANDS, A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY. Arizona Univ., Tucson. Office of Arid Lands Stu-

dies.
For primary bibliographic entry see Field 02F.
W73-07420

REHABILITATION OF A BRINE-POLLUTED AOUIFER.

Arkansas Div. of Soil and Water Resources, Little Rock. For primary bibliographic entry see Field 05B. W73-07431

SIMULATION OF WATER RESOURCES SYSTEMS WITH SPECIAL EMPHASIS ON GROUNDWATER. For primary bibliographic entry see Field 02A. ANALOG MODELS, Nebraska Soil and Water Conservation Commission, Lincoln. For primary bibliographic entry see Field 02A. W73-07452

SIMULATION OF GROUNDWATER SYSTEMS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-07437

UNDERGROUND POLLUTION ANALYSIS AND CONTROL, Cincinnati Univ., Ohio. Div. of Water Resources. For primary bibliographic entry see Field 05B. W73-0761

SALINIZATION OF GROUNDWATER IN ARID ZONES, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. J. Barica.

Water Research, Vol 6, No 8, p 925-933, August 1972. 6 fig, 3 tab, 13 ref.

Descriptors: "Water pollution, "Saltation, "Ion transport, "Water quality, "Saline water intrusion, "Saline water-freshwater interfaces, Saline water, Groundwater, Arid lands, Environmental effects, Irrigation effects, Groundwater recharge, Salinity, Salts.

Natural pollution of surface and groundwaters by inorganic salts (mostly chlorides and sulphates of Na, Mg and Ca) in arid zones is a consequence of the dry climate and the extensive irrigation practices in agriculture. Salts, accumulated in the soil profile after evaporation of the water phase, are redissolved either by fluctuation of shallow groundwater or leached down by fresh irrigation water applied on the soil surface. This results in a continuous increase in groundwater salinity and deterioration of its quality. Two specific cases, typical of arid regions in the Middle East, are considered: (1) shallow groundwaters salinity and deterioration of its quality. Two specific cases, high art tables (0.5-2.0 m) in alluviums of large rivers (Tigris and Ephrates), and (b) deeper groundwaters (5-16 m) in desert areas with non-saline sandy soils of high permeability (Saudi Arabian Plateau). In alluvial regions, groundwaters with a total dissolved soilds concentration as high as 46,000 mg/l can be found. In desert casis areas, layering of relatively fresh water (TDS 7000-12,000 mg/l) can occur. Vertical distribution of groundwater quality within the same aquifer shows pronounced zonation. Methods of water resurrects to supplement the existing water supplies in arid countries are discussed. (Black-Arizona)

WHERE HAVE ALL THE TOXIC CHEMICALS GONE., Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 05B. W73-07676

W73-07642

SELECTED HYDROLOGIC DATA, LOWER BEAR RIVER DRAINAGE BASIN, BOX ELDER COUNTY, UTAH, Geological Survey, Salt Lake City, Utah. For primary bibliographic entry see Field 07C. W73-07679

WATER SUPPLY AT LOS ALAMOS DURING 1971, Los Alamos Scientific Lab., N. Mex. W. D. Purtymun, and J. E. Herceg. Available from NTIS, Springfield, Va., as L.A-5039; \$3 per copy, 95 cents microfiche. Report LA-5039, Oct. 1972. 30 p, 17 fig, 6 tab, 1 append.

Descriptors: "Water wells, "Water requirements, "Groundwater resources, "Hydrology, "Water conservation, "Water supply, Planning, Water management, Artificial recharge, Imported waters, Drawdown, Water table, Well data, Performance, Pumps.

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Total production from the 16 wells in 3 well fields in 1971 was 1,553 million gal. An additional 37 million gal were added to the water supply from a gallery in Water Canyon. Water-level trends in the well fields are as anticipated. Limited pumpage in the Los Alamos and Guaje well fields has slowed or reversed water-level declines in most wells and will thus prolong their lives. The pumping rate at well LA-2 declined owing to increased production. The pumping rate at well G-6 declined owing to pump wear and subsequent failure. The pump is 46-6 was replaced in March. The pumping rate at well G-4 is held to about 200 gpm because of casing deterioration and entry into the well of part of the gravel pack. The well cannot be repaired but must be replaced. An additional new well in the Pajorito well field is necessary to provide adequate supply during periods of peak demand and to meet increasing water needs. Monthly pumping and production data for each of the 16 wells for 1969, 1970, and 1971 are included. (Houser-ORNL) W73-07758

EVALUATION OF THE CONCEPTS OF STOR-ING RADIOACTIVE WASTES IN BEDROCK BELOW THE SAVANNAH RIVER PLANT SITE. National Academy of Sciences, Washington, D.C. Committee on Radioactive Waste Management. For primary bibliographic entry see Field 05G.

EVALUATING THE HAZARDS OF GROUND-WATER CONTAMINATION BY RADIOACTIVI-TY FROM AN UNDERGROUND NUCLEAR EX-PLOSION, California Univ., Livermore. Lawrence Liver-

For primary bibliographic entry see Field 05B. W73-07782 more Lab.

4C. Effects on Water of Man's Non-Water Activities

A REGIONAL APPROACH TO THE LAND-SLIDE SEVERITY PROBLEM IN THE CON-TERMINOUS UNITED STATES, Purdue Univ., Lafayette, Ind. Water Resources For primary bibliographic entry see Field 08E. W73-07168

URBAN INFLUENCES UPON GROUNDWATER CCONDITIONS IN THAMES FLOOD PLAIN DEPOSITS OF CENTRAL LONDON, Institute of Geological Sciences, London (England), Dept. of Hydrogeology. D. A. Gray, and S. S. D. Foster. Royal Society of London Philosophical Transactions, Mathematical and Physical Sciences, Vol 272, No 1221, p 245-257, May 4, 1972. 6 fig, 2 tab, 18 per

Descriptors: *Environmental effects, *Urbaniza-tion, *Groundwater, *Underground structures, Flood plains, Estuaries, Tidal effects, Saline water intrusion, Planning, Engineering structures, Tun-nels, Water quality, Floodgates. Identifiers: *London (England), *Thames River (Regland)

Study of the groundwater in the riverine deposits of the Flood Plain Terrace of the River Thames in Central London indicates that conditions are dominated by manmade influences, particularly the underground railway systems and the river walls. Operation of the proposed Thames barrier in a half-tide mode would modify these influences and could lead to additional drainage problems and affect basement structures. The original concept of a flood-prevention structure across the Thames included consideration of a fixed barrage as well as of a removable barrier selected for construction has been advocated to improve the amenity in Central London by permanently submerging at least part of the intertidal flats. A fixed barrage would cause a rise in groundwater levels throughout the Flood Plain Terrace, as well as in lower reaches of the Lea Valley. The effect of half-tide control of the removable barrier would be similar over much of the area. (Woodard-USGS)

EXTENDED INDUSTRIAL REVOLUTION AND CLIMATE CHANGE, Case Western Reserve Univ., Cleveland, Ohio. For primary bibliographic entry see Field 02B. W73-07493

4D. Watershed Protection

A STUDY OF WATER RESOURCE PUBLIC DECISION MAKING, Cornell University, Ithaca, Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 06B. W73-07158

DYNAMIC CONTRIBUTING AREA MODEL FOR RUNOFF ESTIMATION BASED ON STREAM NETWORK GEOMORPHOLOGY-A-

WATERSHEDS, Purdue Univ., Lafayette, Ind. Water Resources Research Center. For primary bibliographic entry see Field 02A. W73-07169

CONTROL OF SILTING IN RESERVOIRS ON MOUNTAIN RIVERS, Politekhnicheskii Institut, Leningrad (USSR).

M. A. Mikhalev.

M. A. Mikhaiev.

In: Hydraulic research and its impact on the environment, Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971. Vol 5, p 1-4, 1972 (release date). 4 fig.

Descriptors: *Desilting, *Reservoir silting, *Sediment control, Bed load, Suspended load, Erosion, Scour, Sedimentation, Model studies, Hydraulic

Laboratory investigations were conducted to simulate the conditions of scouring and silting in reservoirs and to evolve proposals for flushing out mud to restore available storage. The flood season was found to be the most opportune time for flushing out the reservoir, the effectiveness of scouring increasing with an increasing with an increasing silting and the season with an increasing silting season. ing out the reservoir, the effectiveness of scouring increasing with an increase in the discharge and the slope of the scour rill formed in the reservoir. When the water level decreases rapidly, the danger arises of clogging the bottom outlet with bed material. This occurs when the volume of the flushed out material exceeds the solid discharge capacity of the bottom outlet. Consequently the drawdown rate should be such that the upstream bottom slope of the rill be lower than a certain limiting value, which can be found by establishing the solid discharge capacity of the shuice or the maximum sediment concentration. Calculation procedures are as follows: (1) the volume of sit accumulated during the preceding years is assessed; (2) the drawdown rate for the reservoir is determined as a function of the expected scouring discharge; (3) the volume of the scoured silt is established considering the width of the rill formed in the reservoir, and the canyon wall angles. (K-see LISGS)

CALCULATION OF THE PROCESS OF SEDI-MENTATION AND HYDRAULIC WASHOUT OF RIVER RESERVOIR, Akademiya Nauk Armyanskoi SSR, Erevan. In-stitut Agrokhimicheskikh Problem i Gidroponiki. For primary bibliographic entry see Field 02J. W73-07502

MEANS OF PREVENTING LOSS OF RESER-VOIR CAPACITY THROUGH SEDIMENTA-TION,

Connecticut Univ., Storrs. For primary bibliographic entry see Field 02J. W73-07508

A PROPOSED MEASURE FOR PREVENTION OF VORTEX IN THE ASPIRATOR OF A REACTION TURBINE (PROPOSITION D'UNE MESURE POUR EVITER LA TORQUE DANS PASPIRATEUR D'UNE TURBINE A REAC-

TION), Technische Universitaet, Munich (West Germany). Institut fuer Hydraulische Maschinen und Anlagen.
For primary bibliographic entry see Field 08B.

W73-07510

DECREASE IN CAVITATION EROSION INTEN-

STTY FOR HIGH-HEAD GATES BY USING THE SUPERCAVITATING STRUCTURES, Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenia i Inzhenernoi nicheskikh Sooruzhenia i Inzhene Gidrogeologii, Moscow (USSR). For primary bibliographic entry see Field 08B. W73-07511

HYDRAULIC STRUCTURES OPERATION UNDER CAVITATION CONDITIONS, All-Union Designing Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR). For primary bibliographic entry see Field 08B. W73-07512

CAVITATION TESTS ON BAFFLE PIERS AND BUCKET SPLITTERS OF SPILLWAY HYDRAU-LIC STRUCTURES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 08B,

W73-07514

INVESTIGATION OF RELATIVE CAVITATION RESISTANCE OF MATERIALS AND PROTEC-TIVE COATINGS AND DEVELOPMENT OF MEASURES AGAINST CAVITATION EROSION
OF HYDRAULIC STRUCTURE ELEMENTS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut
Gidrotekhniki, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-07515

CAVITATION DAMAGE DOWNSTREAM FROM OUTLET WORKS GATES, Bureau of Reclamation, Denver, Colo. Engineer-ing and Research Center. For primary bibliographic entry see Field 08B.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4D—Watershed Protection

CAVITATION DAMAGE AT KINZUA DAM, AL-LEGHENY RESERVOIR, Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 08B.

CAVITATION CONTROL IN AN ENERGY DIS-SIPATION STRUCTURE,
Birmingham Univ. (England). Dept. of Civil Engineering. ary bibliographic entry see Field 08B. -07519

EFFECTS OF WATERSHED ENVIRONMENT ON SNOWMELT,

Agricultural Research Service, Danville, Vt. New England Watershed Research Center. For primary bibliographic entry see Field 02C. W73-07660

SEDIMENT CONTROL METHODS: D. RESER-

American Society of Civil Engineers, New York. Task Committee for Preparation of the Sedimenta-

Journal of the Hydraulics Division, Society of Civil Engineers, Vol 99, No HY4, Paper 9671, p 617-635, April 1973. 5 fig, 2 tab, 20 ref.

Descriptors: *Sediment control, *Sedimentation, *Silting, *Reservoir silting, Desilting, Silts, Sedi-

The general subject of deposition of sediment in reservoirs and the problems created by these deposits and their solutions are outlined. The subdeposits and their solutions are outlined. In esub-jects discussed include sources of sediment, esti-mation of quantities delivered to reservoirs, loca-tion of deposits, reservoir problems, and control of reservoir sedimentation. This paper, when finally modified in light of discussions will become section D of Chapter V of the proposed Manual on Sedimentation Engineering. (Knapp-USGS) W73-07670

FLOOD CONTROL AND BEACH EROSION. For primary bibliographic entry see Field 06E. W73-07714

05. WATER OUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

ESCHERICHIA COLI SEROTYPES IN MICROBIAL POLLUTION OF WATER, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. P. J. Glantz.

Available from the National Technical Informa-tion Service as PB-218 710, \$3.00 in paper copy, \$0.95 in microfiche. Technical Completion Report, February 1972. 20 p, 1 fig, 6 tab, 9 ref. OWRR-A-021-PA (1) 14-31-0001-3238.

Descriptors: *Pollutant identification, Water pollution, *Bacteria, *E. coli, Microbiology, Coliforms, *Pennsylvania.
Identifiers: *E. coli serogroups, *Spring Creek

Total and fecal coliform counts from 8 sampling total and tecal conform counts from 8 sampung sites along Spring Creek, Pennsylvania were highest during heavy surface runoff in March and lowest during a January cold spell. These counts remained consistently high at some sites. Two sites located equidistant below 2 different sewage treatments plants ranked second in lowest average total coliform counts, but one of these sites ranked sixth lowest in fecal coliform counts. The E. coli isolates were identified serologically and compared with those isolated from water since 1965. Of 3,200 isolates examined 2,639 were O grouped. All known E. coli O groups with the exception of O groups 24, 30, 32, 33, 52, 62, 95, 114, 127, 131, X23 and x43 were identified. E. coli O groups 21, 18ac and ADOS were most frequent (90 to 115 isolates) and 17 other O groups were identified 40 or more times.

ENVIRONMENTAL CHEMISTRY, Missouri Univ., Columbia. Dept. of Chemistry. S. E. Manahan.

S. E. Manahan.
Willard Grant Press, Boston, Massachusetts, 1972, 393 p. OWRR-A-999-MO (1).

Descriptors: "Water chemistry, Water pollution, Air, Air pollution, Air environment, Microorgan-isms, Chelation, Oxidation-reduction potential, Oxidation, Metals, Pesticides, Fertilizers, Soil chemistry, Organic compounds, Ion exchange, Degradation (Stream), Groundwater, Sediments, Monitorine

Identifiers: Redox equilibria, Complexation, Sul-fur oxides, Nitrogen oxides, Particulate matter.

This book is designed as a textbook for courses dealing with environmental chemistry. It should also be useful as a general reference book. It is based on an intermediate level environmental based on an intermediate level environmental chemistry course. A background in general chemistry plus some exposure to analytical and organic chemistry is assumed. The book is written at a level between the elementary books and the specialized books available in the environmental chemistry area. The book shows how chemistry applies to the environment and pollution. In addition to chemists, it is written for use by agriculturists, life scientists, and engineers. The specific topics covered are the following: (1) scope and purpose of environmental chemistry, (2) the nature and composition of natural waters, (3) redox equilibria in natural waters, (4) complexation in natural waters, (5) microorganisms - the catalysts of aquatic chemical reactions, (6) the role of suspended and sedimentary solids in aquatic chemistry, (7) water pollution and trace substances in water, (8) water treatment, (9) water analysis, (10) environmental chemistry of soil, (11) analysis, (10) environmental chemistry of soil, (11) the nature and composition of the atmosphere, (12) the oxides of carbon, sulfur, and nitrogen in the oxnors of carroon, suntif, and nitrogen in the atmosphere, (13) organic pollutants and photochemical smog in the atmosphere, (14) inor-ganic pollutants and particulate matter in the at-mosphere, (15) monitoring and analysis of at-mospheric pollutants.

WATER TEMPERATURE MEASUREMENT WITH CHEMICAL THERMOMETERS IN LIT-TORAL AREAS OF THE CHESAPEAKE BAY, National Oceanographic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service. For primary bibliographic entry see Field 05C. W73-07187

THE USE OF ULTRA-VIOLET ABSORBANCE FOR MONITORING THE TOTAL ORGANIC CARBON CONTENT OF WATER AND WASTE-

WATER, National onal Environmental Research Center, Cincin-

nati, Ohio. R. A. Dobbs, R. H. Wise, and R. B. Dean. Water Research, Vol 6, No 10, p 1173-1180, 1972. 2 fig. 4 tab, 22 ref.

Descriptors: "Analytical techniques, "Ultraviolet radiation, "Absorption, "Monitoring, "Instrumen-tation, Carbon, Organic compounds, Waste water (Pollution), Rivers, Sewage effluents, Turbidity, Wavelengths.

Identifiers: Total organic carbon, Ultraviolet spec-

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The ultra-violet spectra of most water-soluble compounds are well known. A useful correlation was demonstrated between ultra-violet absorbance and total organic carbon content for aqueous systems. The common inorganic salts, with the exception of transition metal ions, do not have significant absorbance above 250 nm. The correlation between ultra-violet absorbance at 254 nm and total organic carbon content was determined for a variety of treated and untreated water samples which ranged from municipal secondary sewage effluent to raw and processed river water. At the present, absorbance measurements may give a more reliable indication of the organic carbon determinations. The future availability of a more sensitive carbonaceous analyzer ganic carbon determinations. The future availability of a more sensitive carbonaceous analyzer would furnish better data for calculating more reliable correlations for low-level samples. High correlation coefficients were obtained for water samples which contained sufficient organic carbon to permit accurate total organic carbon determinations. Predictably, systems with low total organic carbon levels yielded lower correlation coefficients. However, even with the lower correlation coefficients, absorbance measurements can still be used to monitor a process stream for its organic carbon content if interferences from turbidity do not exceed certain limits. (Jones-Wisconsin) W73-07192 W73-07192

DIVERSITY IN SOME SOUTH AFRICAN DIATOM ASSOCIATIONS AND ITS RELATION

DIATOM ASSOCIATION AND ITS RELATION TO WATER QUALITY, National Inst. for Water Research, Congella (South Africa). Regional Lab. R. E. M. Archibald.

Water Research, Vol 6, No 10, p 1129-1238. 6 fig, 4 tab. 25 ref. Oct. 1972.

Descriptors: *Diatoms, *Biological communities, *Water quality, *Indicators, Dominant organisms, Ecological distribution. Identifiers: *South Africa, Diversity indices, Sequential Comparison Index, Biological association

Diversity in organism populations (species numbers and abundance relative to one another) has bers and abundance relative to one another) has been used in measuring pollution. In a comparison of various diversity indices in diatom associations the simplest in application and equally effective as others, was a Sequential Comparison Index. Com-munity diversity in clean water is generally high and are composed mainly of nitrogen autotrophic species; however environmental factors other than pollution can affect community structure resulting in some associations with low diversities thus in some associations with low diversities thus diversity in clean waters can be very variable. With introduction of small amounts of organic matter, some species, such as nitrogen heterotrophs, which favor the new environment, begin to increase, while some pollution-sensitive species are adversely affected. As a result in mildly polluted water sufficient sensitive species mildly polluted water sufficient sensitive species remain together with increasing numbers of tolerant species to maintain a fairly high diversity. As the pollution load increases progressively greater numbers of sensitive species are eliminated until at extremely high pollution loads some tolerant species are excluded leaving a few most tolerant species in great numbers. Diversity in itself, therefore, is not a reliable estimator of water quality. (Jones-Wisconsin) W73-07194

ALKALINE PHOSPHATASE ACTIVITY IN SUB-TROPICAL CENTRAL NORTH PACIFIC WATERS USING A SENSITIVE FLUOROMET-

RIC METHOD, California Univ., San Diego, La Jolla. Inst. of Marine Resources. M. J. Perry.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

Marine Biology, Vol 15, No 2, p 113-119, 1972. 3 fig, 3 tab, 29 ref. AEC AT (11-1) GEN 10.

Descriptors: *Sea water, *Enzymes, *Analytical techniques, *Fluorometry, Pacific Ocean, Hydrolysis, Phosphates, Cultures, Phytoplankton, Nutrients, Biochemistry, Limiting factors, ysis, Phosphates, Nutrients, Biochemistry, Limiting Oligotrophy. Identifiers: *Central North Pacific, *Alkaline phosphatase activity, Phosphate metabolism.

A sensitive fluorometric assay is described for measuring low levels of phytoplankton alkaline phosphatase in natural seawater samples. The is based on hydrolysis of the ophosphate ester bond of 3-0-methylmonophosphate ester oon of 3-menuty-fluorescein phosphate. This enzyme is synthesized by many microorganisms when phosphate becomes limiting. Alkaline phosphatase activity was measured in water samples from the nutrientverished mixed layer in the subtropical Central North Pacific Ocean in November 1971. The presence of enzyme activity during collection impresence of enzyme activity during collection implies that the phytoplankton were phosphate deficient. It is suggested that a close relationship exists between phosphatase activity and external inorganic phosphate levels. Enrichment of the water column with small amounts of orthophosphate from animal excretions, from vertical diffusion from below the thermocline, etc., may act to repress enzyme activity naturally or to keep its rate of synthesis low. Phytoplankton in water samples lacking enzyme activity at collection produced phosphatase within 1 to 2 days of incu-bation at in situ temperatures. Free inorganic nutrients exist at very low levels, often below analytical limits of detection, in tropical and sub-tropical oceanic waters. The ability of certain phytoplankton to utilize organically bound phosphorus would favor the growth of these speutilize organically bound cies in phosphate-depleted waters. (Jones-Wiscon-W73-07196

EFFECTS OF SILICON ON AUTOMATED METHODS FOR THE DETERMINATION OF PHOSPHATE IN WATER, Department of Agriculture, Ottawa (Ontario). Soil

F. J. Sowden. Canadian Journal of Soil Science, Vol 52, No 2, p 237-243, 1972. 5 tab, 11 ref.

Descriptors: *Analytical techniques, *Phosphates, *Measurement, Instrumentation, Evaluation, Testing procedures. Identifiers: *Silicon, Technicon Auto Analyzer.

Silicon may seriously interfere in determination of readin hosphate-phosphorus in water and a carefu reading of papers may suggest that the effect of Si might be considerable at very low concentrations of phosphorus. High Si concentrations in samples may make data on the P concentration obtained by Auto Analyzer methods meaningless unless the Si interference is corrected. Degree to which Si interferes in P determination depends on the concentra-tion of P and Si, the acid concentration of the reac-tants, and possibly on other factors, for example, tants, and possibly on other factors, for example, time and temperature of heating of reactants. Data indicated that 1 mg Si/1 would increase the apparent P by 2-5 microgram/1. If these results generally apply, then above certain P concentrations the Si interference (as percentage of P present) might be small. Since the isobutanol-extraction procedure for P is affected very little, if at all hy Si its grant of the state of the sta all, by Si, it would appear to be more accurate for low P concentrations than the standard Auto Analyzer method even if a correction for Si is applied to the latter. The usual automated meti may give acceptable results if the Si concentration is determined and a correction for it applied to the appearant phosphorus value. (Jones-Wisconsin) W73-07203

WATER RESOURCES DATA FOR KANSAS, 1971: PART 2. WATER QUALITY RECORDS. Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 07C. W73-07255

DISTRIBUTION OF PROTEUS IN VARIOUS EF-

FLUENTS, Nauchno-Issledovatelskii Institut Moscow (USSR).
For primary bibliographic entry see Field 05B.
W73-07289

BORON CONCENTRATIONS IN DRINKING WATERS OF THE ARMENIAN SSR,
Institute of General and Municipal Hygiene,

Moscow (USSR). For primary bibliographic entry see Field 05B. W73-07299

INDUSTRIAL POLLUTANTS IN WATER

For primary bibliographic entry see Field 05B. W73-07302

ON THE SANITARY ZONE AROUND SEWAGE FARMS IRRIGATED BY SPRINKLING, E. M. Sharkas, and D. G. Krasil'shchikov

E. M. Sharkas, and D. U. Krasui shchicol. Available from the National Technical Informa-tion Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 330-331, July-Sep-tember, 1970. Trans from Gigiena i Sanitariya.

Descriptors: "Waste disposal, "Sludge disposal, "Air pollution, Fertilizers, Bacteria, Waste treat-ment, Ultimate disposal, Agriculture, Farms, Wind velocity, Sprinkler irrigation. Identifiers: USSR, "Sanitary zones (Air).

Although sprinkling with sewage is widely used in sewage farms outside the USSR, data on the possible spread of microflora as a result of sprinkling are scant and contradictory. Results of experi-ments indicate that bacterial contamination is produced in the air depending upon the degree of wind velocity. The findings suggest the need for a sanitary zone of at least 1,000 meters around sanitary zone of a least 1,000 meters around sewage farms using sprinkling. Further investigations of this method should be conducted to determine the feasibility of its use under various meterological conditions. (Smith-Texas) W73-07310

HYGIENIC EVALUATION OF ARTESIAN WATERS USED FOR UTILITY AND DRINKING WATER SUPPLY IN THE TEREKSULAK

LOWLAND, Dagestanskii Meditsinskii Institut, Makhachkala (USSR).

(USSR).

Sh. A. Aliev.

Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 445-446, July-September, 1970. Trans. from Gigiena i Sanitariya.

Descriptors: *Water supply, *Potable water, *Artesian wells, Clays, Mineral water, Organoleptic properties, Aquifers, Subsurface waters, Chemi-

Identifiers: USSR, *Terek-Sulak region (USSR),

The organoleptic properties and composition of subsurface waters in the Terek-Sulak lowland, tapped by 350 artesian wells were investigated. The results indicate that these aquifers possess a high degree of sanitary safety, since they are well protected by plastic clays. Also the total mineral content and the type of minerals found in the subsurface waters display a definite somplify. Arterior, and the subsurface waters display a definite somplify. surface waters display a definite zonality. Artesian

waters from the Terek-Sulak area satisfy the requirements of state standards established by the USSR with regard to chemical and bacterial composition and organoleptic properties. (Smith-Tex-73-07312

RADIOCHEMICAL ANALYSES OF WATER SAMPLES COLLECTED AFTER THE SALMON

SAMPLES COLLECTED AFTER THE SALMON EVENT IN THE VICINITY OF TATUM SALT DOME, LAMAR COUNTY, MISSISSIPPI, Geological Survey, Denver, Colo. V. J. Janzer, B. P. Robinson, and S. J. Rucker. Available from NTIS, Springfield, Va 22151 as USGS-474 115 Price - \$3.00 printed copy; 95 cents microfiche. Geological Survey Report USGS-474-115 (Project Dribble-44), (N.D.). 32 p, 1 fig, 2 tab. (Release date 1972) ase date 1972)

Descriptors: "Chemical analysis, "Groundwater, "Nuclear explosions, "Underground, "Mississippi, Salt marshes, Water analysis, Pollutant identification, Radiochemical analysis, Tritium, Radioisotopes, Correlation analysis, Analytical Rechairms, Descriptories, Water analytical techniques, Data collections, Water pollution

Identifiers: *Salmon Event (Miss), *Tatum salt dome (Miss).

Radiochemical data were obtained by analyzing a series of water samples collected on a periodic basis in the vicinity of the Tatum salt dome, Mississippi. Water samples were collected from December 1964 to March 1965 after the Salmon Event (underground nuclear explosion) from representative aquifers overlying the area of the Salmon Event. Tritium and gross beta determinations were made on all samples and the results are tabulated. Radioactivity of all samples analyzed to date is within the observed range of radioactivity values for water in the vicinity of the Tatum salt dome prior to the Salmon Event. Data for com-parable samples collected before the October 23, 1964 detonation are included. (See also W73-07381) (Woodard-USGS) W73-07380

WATER LEVELS IN OBSERVATION WELLS IN THE TATUM SALT DOME AREA, 1961-65, LAMAR COUNTY, MISSISSIPPI, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B.

MOBILE WATER CONSERVATION LABORA-

Gulf Research and Development Co., Pittsburgh, For primary bibliographic entry see Field 07B. W73-07394

SPECIFIC ION ELECTRODES AS TRANDU-CERS IN CONTINUOUS MONITORING APPLI-

CATIONS, Orion Research, Inc., Cambridge, Mass. Div. of Technical Services.
For primary bibliographic entry see Field 02K.
W73-07400

GAS-CHROMATOGRAPHY DETERMINATION

OF ALIEN SUBSTANCES IN THE WATER OF THE RHINE RIVER, (IN GERMAN), Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).

H. Heilmann.
Ditsch Gewaesserkd Mitt. Vol 15, No 6, p 163-166, 1971, Illus, English summary.
Identifiers: Water analysis, *Pollutant identification, Endosulfan, *Gas chromatography, Germany, Lindane, Parathion, *Rhine River.

Group 5A-Identification of Pollutants

With the aid of gas-chromatography, all organic substances in surface waters subject to volatilization at temperatures of up to about 280C can be determined after the earichment and preliminary separation described. The process of separation and analysis is explained with the biocides thiodane (endosulfan), parathion and lindane services a genules. Courable 1672, Biological A. ing as examples .-- Copyright 1972, Biological Ab-

CADMIUM - A BIBLIOGRAPHY.

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

Available from the National Technical Informa-tion Service as PB-218 829, \$6.75 paper copy, \$0.95 in microfiche. WRSIC 73-209, March 1973. 231 p.

Descriptors: *Cadmium, *Pollutant identification, *Bibliographies, *Abstracts, Documentation, Publications, Water pollution sources, Analytical techniques, Trace elements, Path of pollutants, Water pollution.

This bibliography of 148 abstracts is another in a series of planned bibliographies in water resources produced from the information base comprising Selected Water Resources Abstracts (SWRA). At Selected water Resources Abstracts (SWKA). At the time of search for this bibliography, the data base had 50,631 abstracts covering SWRA through December 15, 1972 (Volume 5, Number 24). Separate subject and author indexes are provided. W73-07419

THE MEASUREMENT OF PLANKTONIC HETEROTROPHY AS AN INDICATOR OF

EUTROPHICATION,
Wayne State Univ., Detroit, Mich. Dept. of Biology. For primary bibliographic entry see Field 05C. W73-07422

WATER RESOURCES DATA FOR TEXAS, 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W73-07346.

TOTAL-EFFLUENT GAS CHROMATOGRAPHY

- MASS SPECTROMETRY, California Univ., Berkeley. Dept. of Chemistry. W. Henderson, and G. Steel.
Analytical Chemistry, Vol 44, No 14, p 2302-2307, December 1972. 7 fig, 1 tab, 18 ref.

Descriptors: "Gas chromatography, "Mass spectrometry, "Carbohydrates, "Chemical analysis, "Methodology, "Pollutant identification, "Sediments, "Microorganisms, Flow rates, Helium, Gases, Organic compounds, Amino acids, Organic acids, Soil analysis, Aquatic soils.

Identifiers: "Steroids, Sensitivity, Resolution, Total effluent gas chromatography, Hydrocarbons, Detection limits, Ion sources, Cholesterol, Campesterol, Stigmasterol, Ergost-7-en-3 beta-ol, C4-ethylcholest-7-en-3 heta-ol, GC-Mass spec-

24-ethylcholest-7-en-3 beta-ol, GC-Mass spectometry

A GC-MS system which allows introduction of a total GC effluent of up to 20 ml/min directly into the ion source of a mass spectrometer is described. The effect of flow rate on ion source and analyzer pressures, overall sensitivity, and resolving power of the system, was evaluated as follows: Source and analyzer pressures were determined as a func-tion of the chromatographic helium flow rate directly introduced to the ion source. The sen-sitivity of the GC-MS system was determined as a function of chromatographic flow rate in terms of the minimum detectable chromatographic peak volume as detected by the TIC beam monitor, rather than as a function of the base peak in the mass spectra. The sensitivity of the mass spectrometer alone was determined using xylene and its base peak at m/e 106 by conventional methods of determining signal/noise ratio, peak width, and mass flow rates. Minimum detectability as a function of both total ion current and evaluable spectra for cholesterol TMS ether was determined, viz., all peaks greater than 10 percent of base peak discernible. Analyses of a variety of organic compounds as mixtures were carried out to illustrate the advantages of the system. It has been shown that 0.1 ag-1.0 pg per second sample flow rates are obtained for cholesterol trimethylsilyl ether at helium flow rates of 1-7 ml/min. Within that flow rate range, only a 12 percent reduction in mass spectrometer resolving power was noted. The system has been shown to be suitable for a wide range of molecules from low molecular weight gases to high molecular weight steroid and carbohydrate derivatives. (Holoman-Battelle)

HIGH ACCURACY DETERMINATION OF CAL CTUM IN BLOOD SERUM BY ISOTOPE DILU-TION MASS SPECTROMETRY, National Bureau of Standards, Washington, D.C. Inst. for Materials Research. For primary bibliographic entry see Field 07B. W73-07560.

SIMULTANEOUS MEASUREMENT OF PLASMA CONCENTRATIONS OF LIDOCAINE AND ITS DESETHYLATED METABOLITE BY MASS FRAGMENTOGRAPHY MASS FRAGMENTOGRAPHY, Northwestern Univ., Chicago, Ill. Medical School. J. M. Strong, and A. J. Atkinson, Jr. Analytical Chemistry, Vol 44, No 14, p 2287-2290, December 1972. 3 fig. 1 tab, 15 ref.

Descriptors: "Methodology, "Chemical analysis,
"Measurement, Pollutant identification.
Identifiers: "Biological fluids, "Lidocaine,
"Monoethylglycinexylidide, "Quadrupole mass
fragmentography, Reproducibility, Metabolites,
Body fluids, Precision, Drugs, Mass spectra,

Lidocaine and its pharmacologically active metabolite, monoethylglycinexylidide (MEGX), have been measured in samples of blood plasma by the technique of quadrupole mass fragmentog-raphy. The standard deviation of the method was 3.1 percent for lidocaine and 7.4 percent for MEGX over the range of concentrations usually encountered in clinical practice. The technique of emountered in canical practice. The technique of mass fragmentography was extended to include rigorous criteria for compound identification based on statistical analysis of the ratio of two fragment ions present in each of these compounds and in the trimecaine added to the plasma samples as an internal standard. These vatios under as an internal standard. These ratios were reproducible with a standard deviation of less than 10 percent. The quadrupole mass spectrometer was found to be a suitable instrument for quantitawas found to be a suitable instrument for quantita-tive mass fragmentography, and offered an impor-tant advantage over presently available magnetic instruments with respect to the range of m/e of the fragment ions that could be recorded. (Holoman-Battelle) W73-07561

SIGNAL ENHANCEMENT IN REAL-TIME FOR HIGH-RESOLUTION MASS SPECTRA, Cornell Univ., Ithaca, N.Y. Dept. of Chemistry. For primary bibliographic entry see Field 02K. W73-07562

DESIGN AND OPERATION OF TEMPERATURE-CONTROLLED MULTIPLE ELEMENT ELECTRODELESS DISCHARGE LAMPS FOR ATOMIC FLUORESCENCE SPECTROMETRY, Florida Univ., Gainesville. Dept. of Chemistry.

For primary bibliographic entry see Field 07B. W73-07563

FLUOROMETRIC METHOD FOR DETERMINING NANOGRAM QUANTITIES OF NITRITE ng-Winthrop Research Inst., Rensselaer, For primary bibliographic entry see Field 02K. W73-07564

SPECTROPHOTOMETRIC DETERMINATION OF COBALT WITH 2,4,6-TRIS (2'-PYRIDYL)-OF CORACI WITH 2,4,5-1 RIS (2-FFRIDTL)-S-TRIAZINE, Texas Univ., Austin. Dept. of Chemistry. M. J. Janmohamed, and G. H. Ayres. Analytical Chemistry, Vol 44, No 14, p 2263-2268, December 1972. 4 tab, 31 ref.

Descriptors: *Color reactions, *Cobalt, *Spectrophotometry, *Pollutant identification, Heavy metals, Methodology, Aqueous solutions, Separation techniques, Chemical analysis, Chemical reactions, Solvent extractions, Iron, Nickel, Copper, Gold, zinc, Hydrogen ion concentration. Identifiers: *2 4 6-tris (2'-pyrigh')-a-triazine, Absorbance, Ionic interference, Precision, Sensitivity, Detection limits, Chemical interference, Ruthenium, Rhodium, Palladium, Osmium, Iridium, Platinum, Molar absorptivity.

Cobalt (II) reacts rapidly with 2,4,6-tris (2'pyridyl)-s-triazine (TPTZ) in water-alcohol solution at pH 8.5 to give a red-orange solution having
absorption peaks at 485 and 404 nm. The color is
stable for at least an hour. The system conforms to
Beer's law. Optimum range for 1.00-cm optical
path is 4 to 20 ppm of cobalt, determined with a
relative standard deviation of about 1 percent. The
molar absorptivity at 485 nm is 2800. Ions of
several transition elements interfere. Cobalt is
separated from iron and nickel by an extraction
procedure using tri-n-butyl phosphate. A reaction
ratio of 1 to 2 for cobalt to TPTZ has been deduced
from spectrophotometric data, and the perchlorate
salt of the complex has been isolated and
analyzed. The ionization constant of the reagent and the formation constant of the cobalt-TPTZ complex have been evaluated. (Holoman-Battelle) W73-07565

ISOTOPE EXCITED X-RAY FLUORESCENCE, New York Univ., Medical Center, N.Y. For primary bibliographic entry see Field 02K. W73-07566

APPLICATIONS OF MASS SPECTROMETRY TO TRACE DETERMINATIONS OF ENVIRON-MENTAL TOXIC MATERIALS, Du Pont de Nemours (E. I.) and Co., Monorovia, Calif. Instrument Products Div.

F. P. Abramson.
Analytical Chemistry, Vol 44, No 14, p 28A-33A, 35A, December 1972. 7 fig, 1 tab, 24 ref.

Descriptors: *Mass spectrometry, *Gas chromatography, *Pollutant identification, *Methodology, *Chemical analysis, Selectivity, Polychlorinated biphenyls, Data processing, Chlorinated hydrocarbon pesticides, Data collections, Aldrin, Dieldrin, Endrin, Heptachlor, DDE, DDD, DDT, Isomers, Laboratory tests.
Identifiers: *Trace levels, Diethylstilbestrol, Detection limits, Sensitivity, Organomercury compounds, N-Nitrosodimethylamine, Data aquisition, Specific ion detection, Mass spectra, Lindene, Chlordane, pp. *DDE, o p.*DDT, pp.*DDD, pp.*DDT, pp.*DDT, pp.*DDT, pp.*DDT, Diethylstilbestrol-dimethylether, Methylmercuric chloride, Aroclor 1260.

The applications of a variety of experimental approaches based on a mass spectrometer to model problems of environmental contamination have been described. Mass spectrometry combined with gas chromatography and/or data acquisition and processing and specific ion detection can be used advantageously to determine various adulterants of interest, such as DES, chlorinated pesticides, of interest, such as DES, Canorinated pseuchies, PCB's, and organomercury in the low nanogram or even in the picogram range. Of particular im-portance is the flexibility in the type of analysis which the rather excellent sensitivity and selectiviwhich the rather excellent sensitivity and acceptance where you are mass spectrometer afford. In addition, the use of isotopic carrier techniques to improve quantitative accuracy where extraction efficiency is a titative accuracy where extraction efficiency is a problem or where adsorption or decomposition accompanies the analytical methodology is readily accomplished with a mass spectrometer by use of relatively inexpensive deuterium derivatives as carriers. Although the initial investment in mass carriers. Annough the initial investment in mass spectrometry is considerable, the number of different analyses which can be performed often with less sample preparation and with higher information content than other methods provide an overall economy for laboratories which carry out such a diverse analytical function. (Holoman-Battelle) W73-07567

CHROMATOGRAPHIC AND SPECTRAL ANALYSIS OF TERPENE AND N-ALKYL AL-COHOL CARBAMATES, Agricultural Research Service, State College,

Miss. Entomology Research Div.
R. C. Gueldner, F. Y. Hutto, A. C. Thompson, and P. A. Hedin.

Analytical Chemistry, Vol 45, No 2, p 376-378, February 1973. 1 fig. 3 tab, 5 ref.

Descriptors: "Separation techniques, Solvent extractions, Chemical analysis, Pollutant identification, Gas chromatography, Methodology, Physical properties, Carbon, Hydrogen, Nitrogen.
Identifiers: "Carbamates, "Terpene alcohols, "Gas-liquid chromatography, "Thin layer chromatography, "n-Alkyl alcohols, "Sample preparation, Infrared spectra, PMR spectra, Elemental analysis, Organic solvents, Proton magnetic resonance spectroscopy, Melting point, Borneol, Isoborneol, Isopulegol, cis-linalool oxide, alphaterpineol, Cedrol, Linalool, 4-terpinenol, n-penanol, n-hexanol, n-heptanol, n-nonanol, ntanol, n-hexanol, n-heptanol, n-nonanol, n-decanol, cholesterol, citronellol.

Preparation of the carbamates of several terpene alcohols and other alcohols by the method of Hedin, Gueldner, and Thompson (1970) and their spectral characterization and the conditions for the separation of the carbamates by TLC and GLC the separation of the carbamates by TLC and GLC are described. The carbamates were prepared by dissolving the alcohol in CC14, adding a molar excess of trichloroacetyl isocyanate (TCALC), allowing the mixture to stand in an ice bath for 5-10 min, and extracting it with KOH in aqueous MeOH. The MeOH phase was removed and evaporated in vacuo to an aqueous residue which was extracted with CC14 until TLC showed the removal of all carbamate. The CC14 phase was expanded to carbamate. The CC14 phase was evaporated to leave the crude carbamate residue, which was crystalized from cyclohexane or cyclohexanebenzene mixtures. Samples were recrystallized to obtain a constant melting point and submitted for elemental (C,N,H) analysis. The carbamates of citronellol and linalool, which could not be crystallized, were collected for elemental and spectral analysis from column A of the gas chromatograph. The method proved to be an easy way to prepare carbamates and gave essentially quantitative yields for recrystalization. Except for the carbayields for recrystalization. Except for the carria-mates of citronellol and linalool, all the com-pounds were white crystalline solids that were sta-ble for extended periods at room temperature. All the elemental analyses checked to within 0.30 per-cent. The melting points, TLC values, GLC the elemental analyses checked to within 0.30 percent. The melting points, TLC values, GLC values, and the IR spectra and PMR data for the CC14 solutions of the carbamates are tabulated. (Holoman-Battelle) W73-07568

DIRECT GAS CHROMATOGRAPHIC ANALY-SIS OF AQUEOUS SOLUTIONS OF ALIPHATIC N-NITROSAMINES, Agricultural Research Service, Fort Collins, Colo. A. R. Mosier, and C. E. Andre. Analytical Chemistry, Vol 45, No 2, p 372-373, February 1973. 2 fig, 1 tab, 10 ref.

Descriptors: *Methodology, *Aqueous solutions, Pollutant identification, Chemical analysis, Gas chromatography, Aquatic algae, Chlorophyta,

Cultures.

Identifiers: "Biological systems, "Chlorella pyrenoidosa, "N-nitrosamines, "Aliphatic hydrocarbons, "Flame ionization gas chromatography, Detection limits, Precision, Quantitative analysis,
Dimethyl nitrosamine, Diethyl nitrosamine,
Dipropyl nitrosamine, Dibutyl nitrosamine.

An analytical procedure has been developed which An analytical procedure has been developed which allows for the direct gas chromatographic analysis of aqueous solutions containing small amounts of aliphatic N-nitrosamines. Standard solutions of dimethyl, diethyl, dipropyl, and dibutyl nitrosamine and algal suspensions (Chlorella pyrenoidosa) spiked with those standard solutions were used to evaluate direct GC as applied to an aqueous biological system. Ascarite precolumns were used, and they served as a cleanup step, thus allowing for relatively interference - free chromatograms except for water. The GC system emmatograms except for water. The GC system emallowing for relatively interference - free chromatograms except for water. The GC system employed readily separates DMN, DEN, DPN, and DBN when injected as an aqueous algal suspension containing 0.2 microgram/ml of each of the four compounds. The sensitivity of the direct analysis of aqueous algal suspensions is much greater than the solvent extract analysis by GC. Direct analysis of aqueous algal suspensions spiked with DMN allows the quantitative determination of DMN down to 10 ng/ml. In order that DPN and DBN can be quantitatively analyzed by this system, the carrier gas flow and column temperature must be increased over the usual operating ture must be increased over the usual operating conditions. With this modification, DPN and DBN can be recovered with about the accuracy of 10 ng/ml. The combination of the Chromosorb 103 column system, the Ascarite precolumn in the in-jection port, and the FID results in a sensitive gection port, and the FID results in a sensitive qualitative and quantitative method for the direct analysis of aqueous biological systems for aliphatic N-nitrosamines. The system is about 100 times more sensitive than methods of N-nitrosamine analysis previously reported. (Holoman-Battelle) W73-07569

ON-LINE COMPUTER CONTROLLED MULTI-PLE ION DETECTION IN COMBINED GAS CHROMATOGRAPHY - MASS SPEC-

DETERMINATION OF ARSENIC (III) AT THE PARTS-PER-BILLION LEVEL BY DIFFERENTIAL PULSE POLAROGRAPHY, Colorado State Univ., Fort Collins. Dept. of

Chemistry.
D.J. Myers, and J. Osteryoung.
Analytical Chemistry, Vol 45, No 2, p 267-271,
February 1973. 6 fig. 2 tab, 44 ref.

Descriptors: "Chemical analysis, "Aqueous solutions, "Pollutant identification, "Methodology, Polarographic analysis, Lead, Electrolytes, Ca-

Identifiers: *Differential pulse polarography, *Arsenic, *Arsenite, Chemical interference, Ionic interference, Tin, Sensitivity, Detection limits, Sulfur acid, Thallium.

The determination of As (III) by differential pulse polarography has been investigated. A number of

supporting electrolytes were studied, and 1M HCl was found to give the greatest sensitivity. The detection was about 0.3 microgam per liter (4 nanomoles) and the response was linear up to 60 mg/l. The inorganic ions which seriously interfered with the analytical procedure were Pb (II), Sn (II), and (IV), and Tl (I) and (III). A procedure was developed to remove the interferences, and it has proved to be satisfactory for all but the lowest concentrations of As (III). After the arsenic polarogram is recorded, Ce (IV) is added to the solution. The As (III) is oxidized to the polarographically inactive As (V), and the excess Ce (IV) is reduced by the mercury metal which has collected (from the DME) at the bottom of the cell. A second polarogram is then recorded, giving the base line. The residual current, caused by capacitance and by the reduction of Pb, Sn, or Tl, is substrated from the first polarogram to give the arsenic signal. This procedure is satisfactory at arsenic concentrations of 20 micrograms per liter and higher, but it significantly raises the position of the base line at an arsenic concentration of 2 micrograms per liter. As (V) could be determined by this method if it were reduced to As (III) and determined according to the proposed procedure. (Holoman-Battelle) determined according to the proposed procedi (Holoman-Battelle)

ATOMIC ABSORPTION DETERMINATION OF NANOGRAM QUANTITIES OF TELLURIUM USING THE SAMPLING BOAT TECHNIQUE, Missouri Univ., Rolla. Dept. of Chemistry.

R. D. Beaty. Analytical Chemistry, Vol 45, No 2, p 234-238, February 1973. 3 fig, 4 tab, 16 ref.

Descriptors: "Methodology, "Chemical analysis, "Aqueous solutions, Heavy metals, Separation techniques, Pollutant identification, Anions, Solvent extractions, Nitrates, Lead, Zinc. Identifiers: "Tellurium, "Trace levels, "Sampling boat method, "Atomic absorption spectrophotometry, Chemical interference, Precision, Recovery, Sensitivity, Organic solvents, Seleni-

Recovery, Sensitivity, Organic solvents, Selenium, Coprecipitation, Methyl isobutyl ketone, Arsenic, Delves cup method.

A method for the determination of ultra-trace quantities of tellurium has been developed, utilizing the sampling boat technique of atomic absorption. Two procedures were developed for the chemical separation of tellurium. In some types of samples, the tellurium can be directly extracted from 4M HCI solution into methyl isobutyl ketone. The relative standard deviation obtained for a typical sample treated in this manner and analyzed by atomic absorption was 5.0 percent. In samples where other constituents cause chemical interference with the extraction, a preliminary separation of tellurium by coprecipitation with selenium rerence with the extraction, a preliminary separa-tion of tellurium by coprecipitation with selenium was employed. The relative standard deviation using this procedure increased to 6.6 percent, but few interferences are observed. Linear response occurs for a range of 5-100 ng tellurium. (Holoman-Battelle)

DETERMINATION OF SUB-NANOGRAM QUANTITIES OF SILVER IN SNOW BY FURNACE ATOMIC ABSORPTION SPECTROMETRY, Montana State Univ., Bozeman.
R. Woodriff, B. R. Culver, D. Shrader, and A. B.

Super. Analytical Chemistry, Vol 45, No 2, p 230-234, February 1973. 3 fig, 12 ref.

Descriptors: *Chemical analysis, *Snow, *Methodology, Pollutant identification, Neutron activation analysis, Heavy metals, Sampling, Solvent extractions, Snowpacks, Cloud seeding, Separation techniques. Identifiers: *Silver, *Trace levels, *Furnace atomic absorption spectrophotometry, Detection

Group 5A-Identification of Pollutants

limits, Reproducibility, Sensitivity, Microsampling boat, Flame atomic absorption spec-trophotometry, Sample preparation, Organic sol-vents, Dithizone, Carbon tetrachloride, Graphite furnace, Preconcentration.

An analytical method for determining microtrace concentrations of Ag in snow is discussed. The method involves preconcentration of the Ag by solvent extraction and its subsequent determination by furnace atomic absorption (FAA). The extractant is a dithizone-CC14 solution. Snow samples were collected by (1) exposing plastic garbage cans containing new plastic liners to snowfall in several locations in the Bridger Mountain Range where corporaphic cloud-seeding experiments were where orographic cloud-seeding experiments were conducted, and (2) digging pits through the entire conducted, and (2) digging pits through the entire snow pack at the end of seasonal seeding operations. The samples were kept frozen until just prior to extraction. Snow placed in a 400-ml beaker was melted on a hot plate and 0.1 N HNO3 was added, decreasing the pH to 3. The sample was noured into a seasonator transle. added, decreasing the pH to 3. The sample was poured into a separatory funnel, a 0.00001 M dithizone-CC14 solution added, and the funnel shaken for 45 seconds. A quantity of the organic phases was placed onto a graphite cup and evaporated under an infrared lamp. For determina-tion, the curves accurated conto a 1/8 inch example. tion, the cup was screwed onto a 1/8-inch graphite rod and inserted into the furnace. Over 225 samples were analyzed, and a comparison among microsampling boat flame AA, NAA, and furnace A shows that the FAA method gives results com-parable with those obtained by neutron activation analysis. FAA's reproducibility is much better than neutron activation analysis in the concentra-tion ranges involved, and determinations can be ed for a fraction of the cost. The results obtained by the boat neutron activation analysis is plus or minus 15-40 percent reproducible, FAA's reproducibility is plus or minus 5 percent. The concentration ranges involved are on the order of 0.5 pg/ml. The sensitivity for the FAA method is 50 pg/ml. (Holoman-Battelle) W73-07573

AN IMPROVED METHOD FOR DETERMINING ORGANICS BY ACTIVATED CARBON AD-SORPTION AND SOLVENT EXTRACTION -

PART I, National Environmental Research Center, Cincin-

R. W. Buelow, J. K. Carswell, and J. M. Symons. Journal American Water Works Association, Vol 65, No 1, p 57-72, January 1973. 17 fig, 15 tab, 17

Descriptors: *Sampling, *Separation techniques, *Water analysis, *Research equipment, Potable water, Organic matter, Adsorption, Activated carbon, Design, Costs, Carbon filters, On-site t Ohio River, Delaware River, Potomac River, Lake Superior, Groundwater, Rivers, Lakes.

Supernor, Groundwater, Kreers, Lakes. Leke St. Clair, Great Miami River, Merrimack River, Kanawha River, Schuylkill River, Allegheny River, Oradell Reservoir, Loch Raven Reservoir, Liberty Reservoir, Carbon chloroform extract, Carbon alcohol extract, Minisampler.

Details are given of research conducted to develop in inexpensive means for determining dissolved organics in water. The result was the development organics in water. The result was the development of a small, reliable, simple-to-operate sampler that passes about 60 1 of water (2-day sampling period) through 70.0 g of granular, coal-based activated carbon at a sampling rate of 20 ml/min. As a companion to the sampler, a small extraction apparatus is used to extract the dried activated carbon with about 450 ml/ms. bon with about 450 cycles of chloroform followed bus with about 450 cycles of 95 percent ethyl alcohol. Time requirements are two days for sampling, one days for adsorbent drying, five days for solvent extraction, and two to three days for extract drying; however, manhour requirements are less than six. After desorption from the activated carbon, the organics can be quantified by gravimetry or analyzed by gas chromatography, infrared spectroscopy, or mass spectroscopy. The equipment was designed primarily for sampling drinking water, but field tests in raw river water and settled water, out ried tests in raw river water and settled water containing carryover floc showed satisfacto-ry performance. Sampling of various waters showed that the technique can determine extract concentrations within a tenfold range in organic content between clean water and surface water polluted with wastes. The cost for materials to build the samplers is about \$100-\$200. (Little-Bat-W73-07574

GAS CHROMATOGRAPHIC DETERMINATION PENTACHLOROPHENOL IN HUMAN

OF PENTACHLOROFIBE.
BLOOD AND URINE,
Hawaii Univ., Honolulu. Pacific Biomedical

Bulletin of Environmental Contamination and Toxicology, Vol 8, No 5, p 294-296, November 1972. 2 tab, 4 ref.

Descriptors: *Gas chromatography.
Identifiers: *Chemical recovery, *Sample preparation, *Urine, *Blood, Biological samples.

A modified procedure for determining pen-tachlorophenol (PCP) in blood and urine involves combining the sample with benzene and H2SO4, rotating for two hours, centrifuging, and removing a portion of the benzene layer. Diazamethane solu-tion is then added to the benzene extract, dry nitrogen bubbled through the solution to remove excess diazomethane, and isocctane added. A excess diazomethane, and isooctane added. A sample of this solution is then injected into a gas chromatograph for analysis by comparison with a known standard. The method gave recoveries of 89 to 96 percent for blood and 90 to 99 percent for urine. No interfering responses were encountered.
The procedure has been found to significantly reduce the time and equipment required to perform these analyses. (Little-Battelle)

AND ORGANIC MERCURY IN TOTAL AND MARINE FISH, Hawaii Univ., Honolulu, Pacific Biomedical earch Cent J. B. Rivers, J. E. Pearson, and C. D. Shultz. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 5, p 257-266, November 1972. 1 fig, 9 tab, 18 ref.

Descriptors: "Mercury, "Atomic absorption spectrophotometry, "Marine fish, Separation techniques, Heavy metals, Metals, Water pollution effects, Fish, Spectrophotometry, Adsorp-

tion, Hawaii.
Identifiers: *Biotransformation, *Sample preparation, *Organomercury compounds, Chemical recovery, Biological samples, Flameless atomic absorption spectrophotometry, Blue marlin, Yellow fin tuna, Skip jack tuna, Dolphin, Squirrel fish, Bigeyed scad, Red goat fish, Mullet, Parrotish, Makaira ampla, Neothunnus macropterus, Katsuwonus pelamis, Coryphaena hippurus, Myripristis arayomus, Trachurops cruenophthalmus, Mulloidichthys auriflamma, Mugil cephalus, Searidae, Methylmercury, Muscle, Liver, Tissue, Excretion, Bioaccumulation.

Tissue from nine species of marine fish caught in Hawaiian waters were analyzed for total and organic mercury by a flameless A4 technique. Samples of muscle tissue were homogenized, digested with conc. HNO3 and oxidized with potassium permanganate. Excess oxidizing agents were reduced with hydroxylamine, and mercury ions were reduced to elemental mercury with stannous sulfate for analysis by AA. Organic mercury was determined by transferring the homogenate with distilled water to a separatory funnel containing

conc. HCl and NaCl, adding benzene, shaking, and centrifuging. The benzene layer was then transferred to a separatory funnel, a l percent cysteine solution added, and the mixture shaken. cysteine solution added, and the mixture shaken. Two ml of the aqueous layer were transferred to an Erlenmeyer flask containing conc. HCl and potassium permanganate. After standing, 5 percent sodium persulfate was added and the solution allowed to stand. The sample was then diluted with an H2SO4-HNO3-distilled water solution, hydrox-lamine solution added, and the flask swirled. Stannous chloride was added to volatilize the mercury for AA analysis. Recovery for total He Stannous chroined was added to volutinze the mer-cury for AA analysis. Recovery for total Hg ranged from 97-106 percent; for organic Hg, the range was 86-104 percent. Tissue content ranged from less than 0.05 ppm to 1.79 ppm for organic Hg and from less than 0.05 ppm to 14.0 ppm total Hg. The blue marlin had the highest content (0.35-14.0 The blue marlin had the highest content (0.35-14.0 ppm) of total Hg. However, the ratio of organic Hg to total Hg was much lower for this species than for others. Since these fish were caught from one area, it is assumed that the mercury occurred from a natural source. It is further hypothesized that at a certain mercury concentration in the tissue, muscle, or liver, the toxic organic mercury is biotransformed to a more easily excreted inorganic form. (Little-Battelle) W73-07576

TOTAL MERCURY-MONOMETHYLMERCURY CONTENT OF SEVERAL SPECIES OF FISH, Food and Drug Administration, Washington, D.C. L. R. Kamps, R. Carr, and H. Miller. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 5, p 273-279, November 1972. 4 tab, 11 ref.

Descriptors: *Fish, *Mercury, Perches, White bass, Pikes, Analytical techniques. Identifiers: *Biological samples, *Methylmercury, Tuna, Swordfish, Northern pike, Sample prepara-

Samples of frozen swordfish steaks, canned tuna, frozen northern pike from Sweden, white bass, and perch were analyzed to determine the percentand perch were analyzed to determine the percentage of total mercury and methylmercury. Total mercury was determined by the method of Munns and Holland and methylmercury by the procedure of Westoo as described by Kamps and McMakon. Samples of edible tissue were chopped in a rotary food chopper and thoroughly mixed before analysis. The results showed that total mercury content of the edible portions of five species of fish ranged from 0.04 to 2.60 ppm. The portion of methylmercury, which was essentially all monomethylmercuryr, ranged from 67 to 125 percent. Sixteen laboracury, which was essentially all monometry mercu-ry, ranged from 67 to 125 percent. Sixteen labora-tories also analyzed samples of white bass and perch for total mercury by cold vapor atomic ab-sorption, the official AOAC procedure with sorpaon, ne orical AOAC procedure with colorimetric determination, and neutron activation analysis. The average contents compared favorably with duplicate results for methylmercury. (Little-Battelle) W73-07577

DETECTION OF IONIC WATER POLLUTANTS BY LASER EXCITED RAMAN SPECTROSCO-

Rhode Island Univ., Kingston. Dept. of Chemis-

try.
S.F. Baldwin, and C. W. Brown.
Water Research, Vol 6, No 12, p 1601-1604,
December 1972. 3 fig, 1 tab, 3 ref.

criptors: *Chemical analysis, *Water analysis, Pollutant identification, Sulfates, Nitrates, Car-bonates, Phosphates, Methodology, Anions, Aqueous solutions, Water pollution, Sea water. Identifiers: "Raman spectroscopy, Detection limits, Raman spectra.

A study was conducted in order to determine the practical minimum concentrations of inorganic anions which can be detected and identified by

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

Raman spectroscopy, and to catalog spectra of pertinent pollutants for future identification purposes. The Raman spectra of aqueous solutions were recorded on a Spex Model 1401 monochromator using a C.R.L. Model 52A argon ion cw laser and a photon counting detection system. Emphasis was placed on the 3 anions nitrate, sulfate, and phosphate. The carbonate ion was used in several experiments to simulate actual situations. The sodium salts of the anions were dissolved in water to form 1 M solutions and their Raman spectra recorded. The samples were then diluted to 50 percent of their original concentration and their spectra recorded again. This process of dilution was continued until the minimal detectable concentration adtected using the described method centrations detected using the described method were 25, 50, 50, and 75 ppm, respectively, of nitrate, phosphate, sulfate, and carbonate anions. In order to determine the feasibility of Raman scattering to detect ionic pollutants in a real situation, mixtures of anions present in concentrations
of 100 ppm were examined. The nitrate and sulfate
anions gave stronger bands and they can be detected in even lower concentrations. Since the
phosphate and sulfate bands are relatively close in
frequency, they would be more difficult to distinguish. The Raman spectrum of a seawater sample
taken from Narragansett Bay yielded a reading of
approximately 2400 ppm sulfate. This study
showed that Raman spectroscopy can be a valuable analytical tool in the detection of inorganic
water pollutants. (Holoman-Battelle)
W73-07579 scattering to detect ionic pollutants in a real situa-

AUTOMATED FLUOROMETRIC METHOD AUTOMATED FLUOROMETRIC METHOD POR DETERMINATION OF BORON IN WATERS, DETERGENTS AND SEWAGE EFFLUENTS, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland

B. K. Afghan, P. D. Goulden, and J. F. Ryan. Water Research, Vol 6, No 12, p 1475-1485, December 1972. 6 fig, 4 tab, 10 ref.

Descriptors: *Boron, *Pollutant identification, *Water analysis, *Chemical analysis, *Sewage effluents, *Methodology, *Detergents, Automation, Chemical reactions, Snow, Ions, Organic com-

pounds.
Identifiers: Chemical interference, 4'-chloro-2hydroxy-4-methoxybenzophenone, Detection limits, Boric acid, Borax, Sodium perborate, Tetraphenyl boron.

An automated method for the determination of An automateu metnoa for the determination of boron in natural waters, detergents and sewage effluents is described. The method is based on the reaction of 4'-chloro-2-hydroxy-4-methoxy-benzophenone (CHMB) with boron to produce fluorescent species, in a 90 percent sulfuric acid medium. The method has been made specific to remove any interferences from all major and minor ions and other organic compounds normally present in water. The method is capable of measuring different chemical forms of boron such as boric acid, borax, sodium perborate and tetraphenyl boron. The method analyzes 10 samples per hour, in the 5-100 ppb boron range. The rate of sample analysis can be increased to 20 per hour at higher concentration ranges. The limit of detection is 1 ppb boron. (Holoman-Battelle)

CONCENTRATION OF ARSENIC FROM WATER SAMPLES BY DISTILLATION, McGill Univ., Montreal (Quebec). Dept. of Chemi-

cal Engineering. E. J. Farkas, R. C. Griesbach, D. Schachter, and

Environmental Science and Technology, Vol 6, No 13, p 1116-1117, December 1972. 1 tab, 11 ref.

Descriptors: *Water analysis, *Chemical analysis, *Separation techniques, *Distillation, *Potable water, Pollutant identification, Water quality con-rol, Methodology, Heavy metals. Identifiers: *Arsenic.

Determination of the amount of arsenic in samples of drinking water is facilitated if the arsenic in the sample can first be concentrated into a smaller volume. The utility of the distillation method described in standard reference works was inrestigated. During the course of the investigation, some of the variables influencing the recovery of arsenic using the distillation method were systematically studied. Optimum conditions for application of this method were determined based on extion of this metaod were determined based on ex-periments in which percentage recovery of the ar-senic present in the original sample was measured as a function of the amounts of the reagents added as a function of the amounts of the reagents added to the original sample and of volume of distillate collected. The following improvements were made in the experimental technique: (1) a carrier gas was not used; (2) the distillation apparatus was closed to the atmosphere except for a side arm on the distillate collection flask which was connected to another flask via tubing; (3) the distillate flask was kept cold and the condensate was led into it via a short dip tube; and (4) after the completion of distillation, 100 ml of cold distilled water was added thereby diluting the HCl in order to avoid an overly violent reaction with the arsenic determina-tion reagents. (Holoman-Battelle) W73-07584

OIL SPILL IDENTIFICATION WITH MICROENCAPSULATED COMPOUNDS SUITA-

BILE FOR ELECTRON CAPTURE, California Inst. of Tech., Pasadena. Div. of Chemistry and Chemical Engineering. B. L. Mitchell, P. G. Simmonds, and F. H. Shair. Environmental Science and Technology, Vol 7, No 2, p 121-124, February 1973. 5 fig, 14 ref.

Descriptors: *Oil spills, *Water pollution sources, *Pollutant identification, Methodology, Tagging, Tracers, Pollutants, Gas chromatography. Identifiers: *Microencapsulation, *Electron cap-Identifiers: *Microencapsulation, *Electron cap-ture gas chromatography, Freon 112, Freon 113, Freon 114B2, Perfluorotoluene, Hexafluorobenzene, Perfluoromethylcyclohexane, Perfluorodimethylcyclobutene.

A technique involving the microencapsulation of high-vapor-pressure compounds suitable for elec-tron capture detection is proposed for the rapid, uous identification of oil slicks. The prin cipal steps in testing a sample are: separating all of the particulate matter, including the microencapsulated tracer, from the oil; opening the microcap-sules at the desired time to release the primary compounds into the airspace overhead; and inject-ing a portion of the overhead gas into the gas chromatograph column. Experimental diffusion studies indicate that the tracer will remain within the indicate that the tracer will remain within the microcapsules during the lifetime of an oil slick. Small-scale field studies were conducted with 30-micron diam microcapsules containing Freon 113. Initial tagging densities of about 100 particles/cu cm were adequate to permit identification for according to a be about 50 permit dentification for the state of least a posth stay the spill. This periods up to at least a month after the spill. This identification technique allows the possibility of providing over a million distinguishable mixtures from 20 primary compounds. (Holoman-Battelle) W73-07589

THE GAS CHROMATOGRAPHIC DETER-MINATION OF PARAQUAT IN WATER, California Univ., Davis, Dept. of Environmental

Toxicology. C. J. Soderquist, and D. G. Crosby. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 6, p 363-368, December 1972. 4 fig, 11 ref. Descriptors: *Paraquat, *Gas chromatography, *Water analysis, *Chemical analysis, *Pollutant identification, Herbicides, Halogenated pesticides, Diquat, Methodology, Solvent extractions, Pesticide residues. Identifiers: Flame ionization gas chromatography, Detection limits, Recovery, Reproducibility.

A simple, inexpensive, and reproducible method for the resolution and specific detection of paraquat in water involves: (1) complete hydrogenation of paraquat to 1,1'-dimethyl-4,4'-bipiperidine (III) in aqueous solution, (2) extraction into organic solvent, and (3) analysis by flame ionization gas liquid chromatography. This procedure has a limit of detectability of less than 0.1 norm but necoveries of only 3,4,4 persons 1.1. procedure has a limit of detectability of less than 0.1 ppm but recoveries of only 36-43 percent at 0.1.0 ppm. The detection limit may be extended by preconcentrating a larger water sample by evaporation or hydrogenation. Although the recoveries are low, they are constant and reproducible. The analysis requires less than one hour per sample. This method may be used for the qualitative confirmation of paraquat or diquat residues. (Holoman-Battelle)

SEPARATION OF ALDRIN FROM AROCLOR

1254, Oregon State Univ., Corvallis. Dept. of Food

Oregon State Univ., Corvains. Dept. of Food Science and Technology.
E. J. Hannan, and D. D. Bills.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 6, p 327-328, December 1972. 1 fig, 3 ref.

Descriptors: *Separation techniques, *Aldrin, *Pollutant identification, Polychlorinated biphenromaint identification, psychiatrianeur oppuen-yls, Dieldrin, Chlorinated hydrocarbon pesticides, Methodology, Gas chromatography, Pesticides, Insecticides, Chemical analysis. Identifiers: *Aroclor 1254, Electron capture gas

chromatography, Column chromatography, En-vironmental samples. Chromatographic peaks.

Two gas chromatographic methods have been found for separating aldrin from polychlorinated biphenyls. The most direct, quickest, and easiest method for quantification involved the use of an OV-225 column on which aldrin will precede Aroclor 1254. The second method involved the use of SE-30/QF-1 and OV-17 columns. Peaks can be trapped from either column and reinjected on the other. The latter method is more applicable to enouter. The latter method is more applicable to environmental samples; it can also be applied to the separation of dieldrin from PCB's only when the peak containing dieldrin is trapped from the SE-30/QF-1 column and reinjected on the OV-17 column. (Holoman-Battelle)
W73-07592

MERCURY METHYLATION IN AN AQUATIC

ENVIRONMENT, Beak (T.W.) Consultants Ltd., Toronto (Ontario). Lab. Div.

D. G. Langley.

Journal Water Pollution Control Federation, Vol. 45, No 1, p 44-51, January 1973. 9 fig, 3 tab, 15 ref.

Descriptors: "Mercury, "Bacteria, "Sediments, Organic matter, Hydrogen ion concentration, Oxidation-reduction potential, Chemical analysis, Sampling, Water analysis, Absorption, Water temperature, Path of pollutants, Water pollution effects, Water pollution control, Pollution abate-

Identifiers: *Goldfish, *Methylation, *Bioaccunulation, *Sediment overlays, Biotransformation, Carassius auratus, Mobilization, Methylmercury, Gas liquid chromatography, Atomic absorption spectrophotometry, Biological samples, Jenkins sampler, Kemmerer sampler, Fluorospar, Sedi-ment treatment.

Group 5A—Identification of Pollutants

Samples of sediment and water from a mercury polluted river were collected with a Jenkins sampoler, a Phleger-type gravity core sampler, and a Kemmerer sampler and returned to the laboratory for chemical characterization and study of mercury methylation. Sediment was analyzed for mercury methylation. Sediment was analyzed by I flameless AA and for organic sediment index by the Ballinger-McKee procedures. Each Jenkins tube was stocked with 10 goldfish in an experiment methylmercury from the underlying mercury-contaminated sediments. Do, tempera-ture, and pH were regularly monitored. Fluorospar tailings were added to four test cells to evaluate their effectiveness in inhibiting methylation. At weekly intervals, two fish from each cell were analyzed for methylmercury by GLC, and the results compared with the compar to concentrate methylmercury from the un mercury-contaminated sediments. DO, t results compared with those from a control group. Results showed that methylation rates varied from 0.12 to 4.83 Ng Hg/wk/sq cm. The cell with the highest methylation rate also had a large bacteria population which may have been responsible for the methylation. Other factors affecting methylation include temperature, pH, redox potential, mercury concentration, and organic concentration. However, under certain conditions, methylation. tion can occur with low Hg concentrations non can occur with low Hg concentrations.

Methylation is too slow a process to permit natural rehabilitation of contaminated sediments, but sealing off the sediments appears to be a promising measure. (Little-Battelle)

W73-07594

MODIFICATION OF QUARTZ ABSORPTION TUBE FOR DELVES CUP-ATOMIC ABSORP-TION SPECTROPHOTOMETRY, New Jersey Coll. of Medicine and Dentistry, Newark. For primary bibliographic entry see Field 02K. W73-07596

BOMB DECOMPOSITION OF BIOLOGICAL

Central Inst. for Industrial Research, Oslo (Norway). P. E. Paus

Atomic Absorption Newsletter, Vol 11, No 6, p 129-130, November-December 1972. 2 tab, 4 ref.

Descriptors: *Chemical analysis, *Trace elements, Methodology, "Pollutant identification, Heavy metals, Mercury, Cadmium, Zinc, Copper, Iron, Lead, Marine algae, Pikes, Neutron activation

analysis, Phaeophyta.

Identifiers: *Bomb decomposition, *Biological materials, *Dissolution, Wet ashing, Ascophyllum

The decomposition bomb has been used successfully in the determination of trace elements in seaweed and fish samples. Approximately 0.5 g (dry weight) of seaweed and pike fish and 0.8 g tuna fish samples were weighed and transferred to the Teflon vessel in the bomb. Known quantities of concentrated H2SO4 and HNO3 were added to the bomb which was then closed and heated to about 100 C. After cooling to room temperature, distilled water was added and the solution diluted to volume in 50-ml volumetric flasks. Those metals determined using the above procedure were Hg, Cd, Zn, Cu, Fe, and Pb. The results were compared with those obtained by other workers using a hot, wet ashing procedure and neutron activation analysis. For the mercury determination the analysis. For the mercury determination the results are in good agreement with the other methods. For the other elements the present method gives results of the same order of magnitude. Bomb decomposition seems to hold promise for rapid dissolution of biological materials. One of the greatest advantages is the complete dissolution of fat. (Holoman-Battelle) W73-07597

MULTI-ELEMENT MICROANALYSES BY DELVES CUP-ATOMIC ABSORPTION SPEC-

TROPHOTOMETRY ON CHELATE/SOLVENT EXTRACTS, New Jersey Coll. of Medicine and Dentistry, Newark. Dept. of Preventive Medicine and Com-munity Health. M. M. Joselow, and J. D. Bogden. Atomic Absorption Newsletter, Vol 11, No 6, p 127-128, November-December 1972. 2 tab, 7 ref.

Descriptors: "Cadmium, "Lead, "Heavy metals," Methodology, Solvent extractions, Chemical analysis, Sampling, Pollutant identification.

Identifiers: "Delves cup method, "Atomic absorption spectrophotometry, "Microanalysis, Precision, Multielemental analysis, Detection limits, Chelated metals, Sensitivity, Trace levels, Chelated, Blood, Biological fluids, Organic solvents.

The recent development of atomic absorption procedures that permit analyses with high sen-sitivity of microliter specimen quantities, together with the use of solvent-extraction techniques, conwith the use of solvent-extraction techniques, con-stitute, in effect, a 2-stage system with the capa-bility for the sequential micro determination of a wide range of metallic elements. The validity and value of this approach is demonstrated with lead and cadmium. Analyses for Pb and Cd were made and cadmium. Analyses for Pb and Cd were made using (1) an accepted macro-procedure, aspiration of the extract of concern through the nebulizer-burner and (2) the micro-sampling cup adaptation of atomic absorption spectrophotometry. For the micro analyses, the technique essentially as described by Fernandez and Kahn (1971), was followed, except that 0.02 ml of MIBK extract, instead of aqueous standards, was delivered into stead of aqueous standards, was delivered into pre-conditioned, matched Delves sampling cups, and dried at 70 C for 3 minutes. The country then inserted into the flame of an atomic absorpand dried at 70 C for 5 minutes. The cups were tion spectrophotometer equipped with a 3-slot burner. The lead analyses were done at 283.3 nm, and the cadmium at 228.8 nm. The data indicate that the micro-sampling cup techniques are as valid as the aspiration technique, yielding quite comparable results. The aspiration technique consumed at least 0.5 ml of the specimen and the micro-sampling technique only 0.02 ml, a reflection of the considerably lower detection limits obtainable with the cup. By applying micro-atomic absorption techniques for the specific metals, sequentially, to the solvent extracts obtained from larger size samples, the concentrations of a wide-range of trace metals can be determined in many matrices, particularly where sample size may im-pose limitations, as with blood, urine, and tissues. (Holoman-Battelle) W73-07598

THE USE OF AN ATOMIC ABSORPTION SPEC-TROPHOTOMETER FOR END-POINT DETER-MINATION: APPLICATION TO CHLORIDE IN

WATERS, Weyerhaeuser Co., Valliant, Okla. For primary bibliographic entry see Field 02K.

ACCESSORY 'GROOVED' TUBES FOR THE GRAPHITE FURNACE, Perkin-Elmer Corp., Norwalk, Conn. For primary bibliographic entry see Field 02K. W73-07600

DETERMINATION OF ANTIMONY IN PETROLEUM USING ATOMIC ABSORPTION SPECTROPHOTOMETRY, Vanderbilt (R. T.) Co., Inc., East Norwalk, Conn.

Analytical Dept.

G. R. Supp.
Atomic Absorption Newsletter, Vol 11, No 6, p 122-123, November-December 1972. 3 tab, 6 ref.

Descriptors: "Methodology, Oil, Chemical analysis, Pollutant identification, Additives. Identifiers: "Petroleum additives, "Antimony, "Atomic absorption spectrophotometry, Ab-

sorbance, Sample preparation, Antimony dialkyl-dithiocarbamate, Antimony O O-dial-kylphosphoro-dithioate.

A fast, simple, and accurate method has been developed for the quality control analysis of production samples of antimony in petroleum additives. The standards and samples are dissolved in an organic solvent (MIBK) and analyzed in an organic solvent (MIBK) and analyzed directly by atomic absorption spectrophotometry. The two types of antimony compounds used as petroleum additives were antimony dialkyldithiocarbamate and antimony 0,0-dialkylphosphorodithioate. They were analyzed by atomic absorption and by a wet analytical method which involved titrating a Kjeldahl mixture with potassium permanganate. Good agreement between the wet method and atomic absorption was attained. The AA results were slightly higher than the wet method, although well within experimental error. Acid breakdown and digestion are eliminated using AA analysis and sample handling is kept to a minimum. (Holoman-Battelle) W73-07601

THE PRECISE DETERMINATION OF LEAD IN WHOLE BLOOD BY SOLVENT EXTRACTION-ATOMIC ABSORPTION SPECTROMETRY, New York State Dept. of Health, Albany. Div. of

Labs. and Research.
D. G. Mitchell, F. J. Ryan, and K. M. Aldons.
Atomic Absorption Newsletter, Vol 11, No 6, p
120-121, November-December 1972. 2 tab, 2 ref.

Descriptors: *Solvent extractions, *Lead, Heavy metals, Pollutant identification, Chemical analysis, Methodology, Instrumentation, Least squares

Identifiers: *Blood, *Atomic absorption spectrophotometry, Biological samples, Precision, Sample preparation, Absorbance, Methyl isobutyl ketone, Organic solvents, Body fluids.

solvent extraction atomic absorption a solvent extraction - atomic absorption precedure is described for the determination of lead in whole blood. The sample is pipetted into a lead-free glass tube, the Triton X-APDC reagent added, and the solution mechanically mixed for 30 sec. A 10-min period is allowed to insure complete beneather after which each of the complete in the properties of t sec. A 10-min period is allowed to insure complete benolysis after which methyl isobutyl ketone (MIBK) is added. The mixture is vigorously shaken for one minute and centrifuged at ca. 2000 rpm for 10 min. The organic phase is removed, and its lead content determined by atomic absorption spectrometry against blank readings of MIBK saturated with deionized water. The standards and annules are analyzed in duplicate and triplicate saturated with defonized water. In extandards and samples are analyzed in duplicate and triplicate, respectively. The digital unit integrates the ab-sorbance signal over 4 sec and then prints out in-tegrated absorbance values. Results are obtained tegrated absorbance values. Results are obtained by manually keying absorbance data into the Wang calculator, which computes the net signal by averaging the background readings before and after sample aspiration and subtracting this value from the sample signal. Net signals are plotted against lead concentrations, and from the equation against lead concentrations, and from the equation of the line of least squares, the concentrations corresponding to the net sample signals are calculated and printed out. The procedure routinely gives relative standard deviations of ca 5 percent at the 45 micrograms/100 ml level, corresponding to confidence limits of plus or minus 3 micrograms/100 ml for triplicate analyses. The effects of sample age, EDTA in blood, and added phosphate on analytical results are also reported. (Holoman-Battelle) W73-07602

THE APPLICATION OF THE LEIPERT AM-PLIFICATION TO INCREASE SENSITYITY IN THE DIRECT DETERMINATION OF IODINE BY ATOMIC ABSORPTION SPECTROMETRY, Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry. G. F. Kirkbright, T. S. West, and P. J. Wilson.

Atomic Absorption Newsletter, Vol 11, No 6, p 113-114, November-December 1972. 1 fig. 1 tab, 3

Descriptors: "Iodine, "Aqueous solutions, Pollutant identification, Methodology, Cations, Heavy metals, Halides, Anions, Alkali metals, Halogens, Solvent extractions, Cobalt, Nickel, Manganese, Chromium, Zinc, Magnesium, Sodium, Aluminum, Chlorides, Sulfates, Phosphates, Nitrates, Iron, Copper, Chemical analysis.

Identifiers: "Leipert amplification method, "Sensitivity, "Atomic absorption spectrophotometry, Detection limits, Recovery, Chemical interference, Absorbance, Methyl isobutyl ketone, Sample preparation, Vanadium.

Sample preparation, Vanadium.

The sensitivity attainable in the direct determination of iodine by atomic absorption at 183.0 am in a nitrogen-separated nitrous oxide-acetylene flame may be increased by as much as 38-fold by application of the Leipert amplification procedure. In the method developed, iodine in the sample solution is oxidized to iodate, each equivalent of which liberates six equivalents of iodine on treatment with excess iodide in weakly acidic solutions. The liberated iodine is extracted into methyl isobutyl ketone and nebulized directly into the flame. The presence of fifty-fold excesses by weight of Co, Ni, Mn, Cr, Zn, Mg, Na, K, Ca, Al, chloride, sulfate, phosphate and nitrate was observed to give rise to negligible effect on the absorbance produced by a 5 ppm iodide solution when present throughout the amplification and extraction procedure. The presence of cations incompatible with iodide in acidic aqueous solutions, for example Fe (III), Cu (II) or V (V), results in interference due to liberation of iodine by oxidation of the excess iodide added to effect the amplification. Under these conditions the interfering ions must be removed by preliminary treatment of the neutral sample solution with cation exchange resin. The amplification extraction procedure is shown to be selective for iodide and to produce an effective sensitivity (for 1 percent absorption) of 0.32 iodide. (Holoman-Battelle) effective sensitivity (for 1 percent absorption) of 0.32 iodide. (Holoman-Battelle)

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PROBLEMS IN THE ANALYSIS OF PHOSPHORUS COMPOUNDS, Southampton Univ. (England). Dept. of Oceanog-

Water Research, Vol 7, Nos 1/2, p291-307, January/February 1973. 1 tab, 76 ref.

Descriptors: *Phosphorus, *Chemical analysis, Water analysis, Filtration, Freezing, Sampling, Phosphates, Nutrients, Automation, Bioassay, Neutron activation analysis. Identifiers: *Chemical interference, *Sample preservation, *Reductants, Orthophosphates, Absorptiometric methods, Detection limits, Photooxidation, Ascorbic acid, Precision, Accuracy, Interlaboratory studies, Arsenic.

Water is most usually analyzed for phosphorus by converting the phosphorus to orthophosphates and using an absorptiometric method in which 12-molybdophosphoric acid is formed and reduced to phosphomolybdenum blue. Review of results from interlaboratory analyses have shown that ascorbic acid in the presence of antimonyl ions is an attractive reducetat for this navgoes. In conditions acid in the presence of antimonyl ions is an attractive reductant for this purpose. In conditions where other ions do not interfere, it is possible to measure accurately the free orthophosphate, organically combined phosphorus, and total condensed phosphates by a photo-oxidation procedure using ultraviolet radiation in which hydrolysis can be minimized. For measurement of total dissolved phosphorus, oxidative digestion with potassium persulfate or photo-oxidation followed by hydrolysis has proved suitable for a wide range of samples. Improvement in analysis must also be accompanied by improvements in filtration and sample preservation. Freezing has been found to be effective for preservation. However, in samples of high biological activity additional preservatives may be needed. Alternative methods for analysis of phosphorus in water are unlikely to compete with the phosphomolybdenum blue procedure for some time. (Little-Battelle) W73-07604

AN IMPROVED METHOD OF PHOSPHORUS ANALYSIS IN SEA WATER, I. Hosokawa, and F. Ohshima. Water Research, Vol 7, Nos 1/2, p 283-289, Janua-ry/February 1973. 3 fig. 4 tab, 5 ref.

Descriptors: "Chemical analysis, "Sea water,
"Phosphorus, Water analysis, Metals, Heavy
metals, Salts, Nitrates, Phosphates, Silicates, Pollutant identification.

Identifiers: "Chemical interference, "Sample
preparation, Reagents, Sample preservation,
Tungstates, Arsenates, Absorptiometric methods,
Tungsten, Germanium, Arsenic, Silicon.

The method of Lucena-Conde and Prat (1957) which employs a reagent of Mo (VI) and Mo (V) for analysis of phosphorus in seawater has been improved by the use of zinc instead of mercury as the reductant of the Mo (VI). The reagent is improved by the use of Zine instead of mercury as the reductant of the Mo (VI). The reagent is prepared by adding 10 ml of conc. HC1 to 10 ml of 2 M Mo (VI) solution and about 0.3 g of pure metallic zinc. After the zinc has dissolved, 28 ml of conc. HC1, 40 ml of conc. H2SO4 and enough water to make 100 ml of solution are added. The reaction is carried out by boiling for 20 minutes. The presence of phosphorus produces a heteropoly blue color with an absorption maximum at 830 nm wavelength. No interference occurs if concentrations of infering ions are less than 100 ppm for Si-SO3, 0.01 ppm for As-AsO4, 10 ppm for W-WO4, and 100 ppm for Ge-GeO3. Nitrate ion reduces sensitivity and must be reduced to nitrate ion if more than 1 ppm is present. Sale error was about -5 percent with chlorinity of 190 percent. (Little-Battelle)

PHOSPHATES IN SEWAGE AND SEWAGE TREATMENT,

Water Research, Vol 7, Nos 1/2, p 55-67, January/February 1973. 6 fig, 2 tab, 15 ref.

Descriptors:

*Colorimetry, *Separation techniques, *Phosphates, *Sewage, *Anion exchange, Analytical techniques, Phosphorus, Chromatography, Waste treatment, Nutrients, Detergents, Silicates, Automation. Identifiers: *Chemical interference, *Fate of pollutants, Orthophosphates, Pyrophosphates, Polyphosphates, Edition, Autoanalyzer, Sample preservation, Sample preparation.

preservation, Sample preparation.

The concentration of reactive phosphate present in sewage fluctuates markedly from hour to hour; much of it is associated with particulate matter. The soluble reactive phosphate can be separated into individual moieties by an automated anion exchange elution technique involving the use of a 1.3-cm i.d. column containing de-acidite FF anion exchange resin, chloride form SRA 71 100/200 mesh. The phosphate content is desorbed from the column by gradient elution with KCI. The phosphates are colorimetrically determined as orthophosphate by reacting with ammonium molybdate in sulfuric acid and hydrazine solution. The natural hydrolysis of higher forms of phosphate to the ortho state can be arrested in samples by the addition of formalin. Molybdenum-hydrazine colorimetric determination appears superior to the molybdenum-vanadate method particularly on the chromatographically separated samples but may need confirmation of reliability for untreated samples for interference from silicates or other substances. Alternatively an automated method for the total phosphorus content

capable of handling homogenized samples of sewage is essential. The phosphate load and fate during sewage treatment will require monitoring over a protracted period because of hourly and seasonal fluctuations which may be substantial. seasonal fluctuations which may be substantial. The greater proportion is, however, removed during treatment in association with particulate matter, albeit a fairly constant concentration in the order of 5-8 mg/l is discharged with the effluent. (Little-Battelle) W72.07611 W73-07611

ADSORPTION OF PARATHION IN A MUL-TICOMPONENT SOLUTION, Wisconsin Univ., Madison. Water Chemistry Pro-

gram.
W-C. Wang, G. F. Lee, and D. Spyridakis.
Water Research, Vol 6, No 10, p 1219-1228, October 1972. 4 fig, 4 tab, 17 ref.

Descriptors: "Phosphothioate pesticides, "Ad-sorption, "Aqueous solutions, "Pollutant identifi-cation, "Separation techniques, "Pesticide removal, "Methodology, Lake sediments, Organic compounds, Kaolinite, Montmorillonite, Organic matter, Chemical analysis, Water analysis, Organic chromatography, Fluorometry, Centrifugation. Identifiers: "Parathion, "Rhodamine B, "Adsor-bents, Electron capture gas chromatography, Sample preparation, Organic dyes, Organic car-bon, Carbon analyzer.

Parathion adsorption was studied with emphasis on the effect of the presence of a secondary adsor-bate (rhodamine B). The adsorbent materials used included kaolinite and monmorillonite clay minerals and treated and untreated lake sediments. minerals and treated and untreated lake sediments. The adsorption experiments were conducted in a system free of organic solvent. A desired amount of clay mineral or sediment was placed in the 50 ml flask, which already contained a given amount of parathion. Thirty milliliters of distilled water were added to the flask, and the mixture was equilibrated by shaking. Depending on the experiment, an organic compound was added to the flask to make a final volume of 30 ml. The mixture was baken in a water bett baker at 200 et topset/min at to make a final volume of 30 ml. The mixture was shaken in a water bath shaker at 200 strokes/min at 20C, unless otherwise specified. It was then centrifuged at 1500 g for 1 h. The supernatant was poured out and extracted three times with 8 ml hexane, and the combined extract was made to a final volume of 25 ml in a volumetric flask prior to analysis with gas chromatography. With rhodamine B, the quantity of parathion adsorption on different clay minerals increased two- to four-fold, while methylene blue and phenol had little or no effect. Rhodamine B was readily sorbed by clay minerals, and the formed organoclay complex also minerals, and the formed organoclay complex also enhanced the parathion adsorption capacity when the organic matter was partially extracted from the sediment particles. (Holoman-Battelle) W73-07613

NEW METHOD OF DETECTION FOR THE COMPONENT OF LOW CONCENTRATION IN WATER BY DETECTOR TUBES, Yokohama National Univ. (Japan). School of En-

gineering. Y. Kobayashi. Water Research, Vol 6, No 11, p 1291-1299, November 1972. 4 fig, 3 tab, 4 ref.

Descriptors: *Water analysis, *Urine, *Sulfides, *Chlorides, *Sulfates, *Chlorine, *Nickel, *Colorimetry, *Chromium, Drinking water, Air, Rain, River water, Calibrations, Color reactions, Heavy metals, Waste water (Pollution), Laboratory equipment.

ry equipment.
Identifiers: *Blood, *Detector tube, *Cyanides,
Detection limits, Chemical interference, Reagents,
Accuracy, Biological samples, Chromates.

Five glass tubes, 2-3 mm in diameter, have been used for detecting minor components in water by

Group 5A—Identification of Pollutants

packing them with detector reagents and exposing them to the substance to be analyzed. When the proper reagent is used, a color change occurs and the length of the stain is proportional to the concentration of the contaminant. Using the procedure, it was possible to detect sulfide at ranges of 1-100 ppm and hexavalent Cr at ranges of 5-800 ppm using silica gel supplemented with lead acetate; chloride ion at ranges of 50-2000 ppm using silica gel and siver chromate; sulfate ion at ranges of 100-3000 ppm with tetrahydroxy quinone and its barium salt with silica gel; cyanide ion at ranges of 1-50 ppm with orthotolidine hydrochloride and copper sulfate with silica gel; free chlorine at ranges of 1-40 ppm with orthotolidine sulfate and silica gel; and nickel ion at ranges of 100-3000 ppm with dimethylglyoxine and silica gel. The method is rapid and simple and may be used satisfactorily for drinking, process, nges of 1-100 ppm and hexavalent Cr at ranges may be used satisfactorily for drinking, process, or waste water examination, and air, blood, or urine examination. Results of analyses for chloride in matter from deposit gauges and for chromate in plating water are included. Interfering ions are plating water are included. Interest listed for each of the components detected. (Little-W73-07616

AUTOMATIC GAP CONTROL UNIT FOR SPARK SOURCE MASS SPECTROMETRY, Virginia Univ., Charlottesville. Dept. of Chemistry. For primary bibliographic entry see Field 02K. W73-07620

LASER EXCITED ATOMIC AND IONIC FLUORESCENCE OF THE RARE EARTHS IN THE NITROUS OXIDE-ACETYLENE FLAME, Florida Univ., Gainesville. Dept. of Chemistry. For primary bibliographic entry see Field 02K. W73-07621

PHENOL BLUE AS A SOLVENT POLARITY IN-DICATOR FOR BINARY APROTIC SOLVENTS, Southwestern Coll., Winfield, Kans. Dept. of Chemistry. For primary bibliographic entry see Field 02K. W73-07622

ON THE SPECTROPHOTOMETRIC DETER-MINATION OF DISSOLVED SILICA IN NATU-RAL WATERS.

Rhode Island Univ., Kingston. Graduate School of Oceanography. For primary bibliographic entry see Field 02K.

SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF BARIUM AND STRON-

TRUM USING SULFONAZO III, Oregon State Univ., Corvallis. Dept. of Chemistry. P. J. Kemp, and M. B. Williams. Analytical Chemistry, Vol 45, No 1, p 124-129, January 1973. 8 fig, 4 tab, 13 ref.

Descriptors: *Strontium, *Aqueous solutions, *Colorimetry, *Absorption, Spectrophotometry. Identifiers: *Barium, *Sulfonazo III, Chemical interference, Detection limits.

Sulfonazo III (2,7-bis (21-sulfonophenylazo)-1,8-dihydroxy-3,6-naphthalenedisulfonic acid), a promising reagent for barium and strontium determination, was studied for direct simultaneous determinations in the presence of diverse metal ions masked by chelons EGTA and CDTA. An absorbance study revealed that there is no pH sensitivity of the complexes of the pH range 2,5 to 7.7. The addition of the chelons EGTA and CDTA at pH 6 eliminates the interference of most cations except copper which has a light blue chelon complex. The use of EGTA at pH 6.1 and CDTA at pH 6.8 permits the determination of barium and stron-

tium. Simultaneous equations derived from Beer's law facilitate the analysis. The working range of the method is from 1.4 to 4.1 ppm for barium and from 1.8 to 7.0 ppm for strontium. An aqueous the method is from 1.4 to 4.1 ppm for outline and from 1.8 to 7.0 ppm for strontium. An aqueous solution of sulfonazo III shows less than I percent decomposition in seven days. With periodic calibration, the analytical reagent can be considered stable for several months. Under these conditions, the determination is accurate to within 2 percent of the actual concentrations. The proper-ties of the free reagent were also investigated. (Little-Battelle) W73-07624

NUCLEAR MAGNETIC RESONANCE STUDIES OF THE SOLUTION CHEMISTRY OF METAL COMPLEXES, DETERMINATION OF FORMA-TION CONSTANTS OF METHYLMERCUTY COMPLEXES OF SELECTED CARBOXYLIC

Alberta Univ., Edmonton. Dept. of Chemistry. S. Libich, and D. L. Rabenstein. Analytical Chemistry, Vol 45, No 1, p 118-124, January 1973. 8 fig, 3 tab, 13 ref.

Descriptors: *Aqueous solutions, *Mercury, Volumetric analysis, Ionization, Hydrogen ion

Identifiers: *Proton magnetic resonance, *Methyl-mercury, *Carboxylic acid, *Equilibrium con-stants, *Formation constants, *Ionization con-stants, Thiosulfates, Potassium acetate.

Because of the importance of methylmercury in Because of the importance of methylmercury in the environment, its coordination chemistry in aqueous solutions was investigated. Specifically, the aqueous solution chemistry of methylmercury and of the methylmercury complexes of eight carboxylic acids of pK sub A values ranging from 1.00 to 4.95 was investigated by proton magnetic resonance spectroscopy. Equilibrium constants for the reaction of CH3HG (plus) with hydroxide ion to form CH3HgOH and with CH3HgOH to ion to form CH3HgOH and with CH3HgOH to form (CH3Hg)2OH (plus) were determined from the pH dependence of the chemical shift of the methyl group of methylmercury. The formation constants of the methylmercury complexes of the carboxylic acids were determined from the pH dependence of the chemical shift of the methyl group of methylmercury, from the pH dependence of the methylmercury, and the pH dependence of the methylmercury, and the pH dependence of the methylmercury, and the pH dependence of the methylmercury, and the pH dependence of the methylmercury, and the pH dependence of the methylmercury and the pH dependence of the methylmercury. mercury-proton spin-spin coupling constant of methylmercury, and from the pH dependence of the chemical shift of the ligand protons in solu-tions containing equimolar concentrations of methylmercury and carboxylic acid. The formation constants of the methylmercury complexes are found to increase linearly as the acid ionization constants decrease. (Little-Battelle) W73-07625

EXTRACTION AND CONCENTRATION OF OR-GANIC SOLUTES FROM WATER, Geological Survey, Denver, Colo. Water GANIC SOLUTES FROM MALEK, Geological Survey, Denver, Colo. Water Resources Div. M. C. Goldberg, L. DeLong, and M. Sinclair. Analytical Chemistry, Vol 45, No 1, p 89-93, January 1973. 3 fig, 2 tab, 7 ref.

Descriptors: *Separation techniques, *Laboratory equipment, *Distillation, Instrumentation, Water analysis, Organic matter. Identifiers: *Dissolved organics, *Preconcentration, Liquid-liquid extraction, Organic solvents, Chemical concentration, Chemical recovery.

An organic extraction and concentration apparatus is described that will separate and concentrate organic materials from water. It employs any given organic solvent as long as that solvent is immiscible in water, and it will concentrate a given ague ous organic solute up to a factor of 100,000 with the stipulation that the solute partitions between water and the organic solvent. The differential in vapor pressure between solute and solvent does not seem to be a factor that regulates concentra

tion efficiency. The dipole moment difference between solute and solvent will indicate the ex-traction efficiency and can be used as an index to select the extraction solvent. For broad spectrum extraction, several solvents can be used either in a series or parallel extractor trains; and with adequate dipole moment differences between sol-vents, the extractor train will selectively concen-trate on the basis of solute-solvent dipole moment match. (Little-Battelle)

GAS CHROMATOGRAPHIC STUDIES OF SORPTIVE INTERACTIONS OF NORMAL AND HALOGENATED HYDROCARBONS WITH WATER-MODIFIED SOIL, SILICA, AND

CHROMOSORB W,
California Univ., Riverside. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-07627

APPLICATION OF PATTERN SEPARATION TECHNIQUES TO MASS SPECTROMETRIC DATA. DETERMINATION OF HYDROCARBON DATA. DETERMINATION OF HYDROCARDON TYPES AND THE AVERAGE MOLECULAR STRUCTURE OF GASOLINE, Shell Development Co., Houston, Tex. D. D. Tunniciiff, and P. A. Wadsworth. Analytical Chemistry, Vol 45, No 1, p 12-20, January 1973. 9 tab, 6 ref.

Descriptors: *Molecular structure, Mass spectrometry, Organic compounds, Pollutant identifi-

cauon. Identifiers: *Mass spectra, *Gasoline, Paraffins, Naphthenes, Cyclopropanes, Cyclobutanes, Cyclopentanes, Cyclohexanes, Aromatic com-pounds, Monoolefins, Diolefins, Cyclic olefins, Benzene, Toluene.

The mass spectra of a large group of pure compounds typical of those found in gasoline have been used to derive a set of weight vectors which can be used to determine the average properties of gasoline samples. The evaluation of the results obtained on real samples is rather difficult since the true values for all the calculated properties are not readily available. A comparison of the results obtained for hydrocarbon types such as paraffins, naphthenes, and aromatics agree quite well with naphthenes, and aromatics agree quite well with the results obtained by conventional mass spec-trometric analysis provided the average carbon number does not exceed 8.0. This method has also been found useful for the determination of the percent weight of carbon in hydrocarbon samp from the values for numbers of carbon and hydrogen atoms obtained in the structural hydrogen atoms obtained in the structural analyses. The computed percentages of carbon for 41 samples compared favorably with the results as determined by combustion analysis. It must be emphasized that the present work represents principally an investigation of a new approach to the analysis of very complex mixtures. This same approach may be applied to the interpretation of many other kinds of analytical data. Its principal advantage is in the analysis of very complex mixtures where the number of components exceed the number of analytical measurements. Another advantage of this method is the simplicity of its application to actual samples. (Little-Battelle)

COMPUTER IDENTIFICATION OF MASS SPECTRA USING HIGHLY COMPRESSED SPECTRAL CODES,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 07C. W73-07629

DUAL CHANNEL SYNCHRONOUS INTEGRA-TION MEASUREMENT SYSTEM FOR ATOMIC FLUORESCENCE SPECTROMETRY, Illinois Univ., Urbana. School of Chemical

For primary bibliographic entry see Field 07B. W73-07630

GAS CHROMATOGRAPHIC ANALYSIS OF AQUEOUS PHOSPHATE BY REACTION GAS CHROMATOGRAPHY, Southwest Minnesota State Coll., Marshall. Chemistry Program. P. M. Wiese, and R. H. Hanson. Analytical Chemistry, Vol. 44, No. 14, p 2393-2394, December 1972. 1 fig, 6 ref.

Descriptors: "Phosphates, "Aqueous solutions, "Methodology, "Chemical analysis, Pollutant identification, Anions, Gas chromatography, Sulfates, Separation techniques. Identifiers: "Reaction gas chromatography, Detection limits, Sensitivity, Chemical interference, Silylation, NO-bis (trimethylsity)trifluoracetamide, Trimethylchlorosilane, Ionic interference, Thiosulfates, Oxalates, Pyrophosphates.

A reaction gas chromatographic method is described for the analysis of aqueous phosphate solutions. This method involves injecting the phosphate solution into a heated precolumn where the water is vaporized and swept away leaving the salt deposited in the reaction precolumn. N,O-bis (trimethylshiyltirilluoracetamide (BSTFA) containing one percent trimethylchorosilane (TMCS) is then injected into the heated precolumn. In 2 minutes the suscens sillusting respect converts the is then injected into the heated precolumn. In 2 minutes the gaseous silylating reagent converts the nonvolatile phosphate salt to the volatile compound (TMS)3PO4. The excess reagent and (TMS)3PO4 are then swept into an analytical column and separated. Total time for analysis is less than 20 minutes per sample. Solubility considerations have been eliminated. The ion exchange step was simplified by adding ammonium chloride to the sample before injection. This method has proved useful for amounts of phosphate between 10 and 100 micrograms ner inshosphate between 10 and 100 micrograms per inphosphate between 10 and 100 micrograms per injection. Repetitive aliquots of an ammonium phosphate solution gave reproducible peak areas within an experimental error of plus or minus 2.7 percent. When the sodium or potassium salt was used, greatly reduced peak areas were obtained. Temperature programming is necessary to separate (TMS)3PO4 from the derivatives of other contaminant anions such as sulfate, thiosulfate, oxalate, and pyrophosphate. If these anions are not present, the chromatograms may be run isothermally. (Holoman-Battelle) phos

MULTICOMPONENT PATTERN RECOGNI-TION AND DIFFERENTIATION METHOD, ANALYSIS FOR OIL IN NATURAL WATERS, Rocketdyne, Canoga Park, Calif. I. Lysyj, and P. R. Newton. Analytical Chemistry, Vol 44, No 14, p 2385-2387, December 1972. 2 tab, 3 ref.

Descriptors: "Oil, "Chemical analysis, "Water analysis, "Separation techniques, "Pollutant identification, Water pollution sources, Algae, Organic matter, Mixtures, Gas chromatography, Oil spills, Methodology. Identifiers: "Pyrolysis, "Gas-liquid chromatography, Motor oil, Fingerprinting, Characterization, "Pattern recognition.

Based on the theory of multicomponent pattern recognition and differentiation, a study was conducted to characterize pyrographically complex organic composition, such as found in a petroleum product and algae as separate entities, and to determine the quantity of each in a mixed solution. determine the quantity of each in a mixed solution. Dried algae and outboard motor oil were used as test material and a specific pattern, or numerical fingerprint, was obtained for each pyrographically. The algal pattern consisted of three specific and seven common (with oil pattern) peaks. The oil pattern common (with algal pattern) peaks. Numerical values for each peak of each substance were dif-

ferent and formed a specific identifiable pattern or fingerprint. Mixtures of oil and algal suspensions in water were prepared in various proportions and analyzed pyrographically. The composite pyrograms were then analyzed mathematically by a computer. The results of the completed experiments indicate that complex organic compositions can be defined interms of pyrographic patterns, as separate entities with identities of their own, i.e., algae, motor oil. When a number of such complex organic compositions are present in an admixture, they can be differentiated qualitatively and quantitatively by solving a number of simultaneous equations in least squares mode. This technique also has a potential for identifying sources of oil spills in aquatic environment. To acheive differentiation between various sources of crude oils, far more complex pyrograms must be developed. This can be accomplished by performing pyrolysis at lower temperatures and increasing GC separation of produced derivative composition. The practical use of this method for oil spill surveillance and source identification is further compounded by the fact that the composition of spilled oil is unstable in aquatic environments. (Holoman-Battelle) Battelle) W73-07632

DIRECT DETERMINATION OF SULFUR IN OILS BY ATOMIC ABSORPTION SPECTROMETRY USING AN INERT GAS SHIELDED NITROUS OXIDE-ACETYLENE FLAME, Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry. G. F. Kirkbright, M. Marshall, and T. S. West. Analytical Chemistry, Vol 44, No 14, p 2379-2382, December 1972. 2 tab, 11 ref.

Descriptors: *Oil, *Chemical analysis, *Sulfur, Pollutant identification, Research equipment, Laboratory equipment. Identifiers: *Atomic absorption spec-Identifiers: *Atomic absorption trophotometry, Fuel oil, Crude oil, Absorb Precision, Sample preparation, Dibenzyl disulfide, Isobutyl methyl ketone, Organic solvents.

An experimental atomic absorption spectrometer has been used for the direct determination of total sulfur in crude and fuel oils. A sulfur microwave-cacited electrodeless discharge lamp source and an inert gas separated nitrous oxide-acetylene flame were used in conjunction with a vacuum monochromator equipped with a photomultiplier and digital frequency meter to permit detection by photon counting. Oil samples (0.2-1.0g) were dissolved in isobutyl methyl ketone, diluted to volume in a 100-ml flask, nebulized in the separated nitrous oxide-acetylene flame, and the absorbance measured at 180.7 nm. Known quantities of sulfur were added to some of the samples absorbance measured at 180.7 nm. Known quantities of sulfur were added to some of the samples
being analyzed. Calibration curves to be used in
calculations were obtained by analyzing standard
solutions prepared by dissolving dibenzyl disulfide
in isobutyl methyl ketone. The values obtained by
AAS for the oil samples whose sulfur contents
were determined by reference to the calibration
curve for dibenzyl disulfide in MIBK show a small
systematic negative error companed to the mean systematic negative error compared to the mean values obtained by X-ray fluorescence. No significant systematic error was observed in the values for sulfur content obtained for the oils treated by Ior sulfur content obtained for the oils treated by the standard additions technique. This suggests that the assumption that a mismatch between sample and standard viscosity characteristics is responsible for the error observed in the conventional calibration technique is correct. The direct nebulization of diluted oil samples into the inert gas separated nitrous oxide-acetylene flame permits the rapid direct determination of their sulfur content had a content of their sulfur content had been supported to the content of their sulfur content had been supported to the sulfur content had been supported to the content had been supported to the sulfur content had been supported to the content had been supported to the sulfur cont muts the rapid direct determination of their sultru content by AAS at 180.7 nm with acceptable accu-racy and precision. The attainable sensitivity should be sufficient for the determination of sulfur in most refined oils (except motor gasoline). Dibenzyl disulfide is suitable for use in the preparation of standard solutions, and no errors due to the presence of different sulfur compounds

in the oils are observed when this standard com-pound is employed. The standard additions technique provides freedom from the need to match the standard and sample compositions accu-rately via use of a sulfur-free base oil. In spite of the efficiency of the monochromator, an AAS to permit nitrogen or argon purge might more con-veniently be used. (Holoman-Battelle) W73-07633

POTENTIOMETRIC TITRATION OF SULFATE USING AN ION-SELECTIVE IRON ELECTRODE,

Treas Instruments Inc., Dallas. R. Jasinski, and I. Trachtenberg. Analytical Chemistry, Vol 44, No 14, p 2373-2376, December 1972. 4 fig. 3 tab, 7 ref.

Descriptors: *Sulfates, Hydrogen ion concentra-tion, Equipment, Selectivity, Iron, Volumetric analysis, Iron, Nitrates, Electrolytes, Instrumentation, Electrochemistry, Aqueous solutions, Pol-lutant identification, Heavy metals.

Identifiers: "Ion selective electrodes, "Potentiometric titration, "Iron electrode, Sensitivity, Glass electrodes, Precision, Reproducibility, Detection limits, Metal complexes, Monitoring, Sulfate electrode, Barium chloride, Sensors.

A description is given of an indirect sulfate elec-trode which is based on the ferric ion/sulfate complex ion equilibria and is free of many of the restrictions common to other ion selective elec-trodes that have been used for the potentiometric titration of sulfate. The electrode used in this titration of sulfate. The electrode used in this study was constructed by cementing slices of Fe1173 glass (Ge28Sb12Se60) to the end of an acrylic tube. After mechanical polishing, the electrode was activated by rinsing within NaOH, wiping, rinsing with distilled water and finally exposing it to 0.1 M ferric nitrate solution at pH 1.6 for 30 minutes. Since the Fe-1173 glass does respond selectively to uncomplexed ferric ion in sulfate solutions, an evaluation was made of the electrode as a monitor for sulfate ion titration. Calculations solutions, an evaluation was made of the electrode as a monitor for sulfate ion titration. Calculations indicate that the sulfate-Fe complexes are too weak to yield a well-defined end point from titrating sulfate directly with iron. If, however, a titrant is so chosen to remove sulfate from the complexes, thus releasing ferric ion, a satisfactory titration curve is generated. The following conclusions were drawn based on the above: (1) At constant I-H and total sulfate concentration the prisions were drawn based on the above: (1) At constant pH and total sulfate concentration, the primary effect of changing total soluble Fe is Nernstian. (2) A second-order change in sensitivity also results from changing iron content. (3) the optimum operational region for sulfate monitoring is pH 1.7-2.0 and 0.1 mM Fe. (4) the accessible sulfate concentration range is greater than about 200 ppm. (5) This electrode system will yield distinct titration end points if the titrant is chosen so as to remove sulfate ion from solution, liberating uncomplexed iron. (Holoman-Battelle) W73-07634

ANALYSIS OF MIXTURES OF AMINOPOLYCARBOXYLIC ACIDS BY CHEMICAL KINETICS. PARTS PER BILLION OF NITRILOTRIACETIC ACID IN WATER, Purdue Univ., Lafayette, Ind. Dept. of Chemistry. L. C. Coombs, J. Vasiliades, and D. W. Margerum. Analytical Chemistry, Vol 44, No 14, p 2325-2331, December 1972. 2 fig. 5 tab, 28 ref.

Descriptors: "Chemical reactions, "Nitrilotriacetic acid, "Water analysis, "Chemical analysis, "Methodology, Spectrophotometry, Computers, Organic acids, Pollutant identification, Ions, Nickel, Automation. Identifiers: "Aminopolycarboxylic acids, Detection limits, Precision, Chemical interference, Reaction kinetics, Cyanides, Sensitivity, EDTA, 12-PDTA, EDDA, EGTA, IDA, MIDA, HPDTA, HEEDTA, CyDTA, Metal complexes.

Group 5A-Identification of Pollutants

Aminopolycarboxylic acids are detected and reaction of cyanide ion with their nickel (II) complexes in basic solution. The procedure is based on the large differences in the rate of formation of tetracyanonickelate ion. Simultaneous kinetic determinations of two-component (NTA, EDDA, and ECTA) mixtures are accomplished by on-line regression analysis of stopped-flow spectrophotometric data. As little as 10 ppb of NTA in natural water samples can be detected. Any possible interference by metals can be eliminated by precipitating them as hydroxide or by running the solution to be determined through a cation-exchange column to remove the metals. However, the formation of mixed cyano complexes can be a source of interference. Trace amounts of NTA in EDTA and a four-component (ECTA, HPDTA, HEEDTA, and EDTA) mixture also are determined off-line. (Holoman-Battelle)

DETECTION AND VARIABLE TIME KINETIC DETERMINATION OF MICRO AND SUBMICROGRAM AMOUNTS OF NITRILOTRIACETIC ACID, Okalhoma State Univ., Stillwater. Dept. of Chamistry Chemistry. H. A. Mottola, and G. L. Heath. Analytical Chemistry, Vol 44, No 14, p 2322-2324, December 1972. 3 fig, 29 ref.

Descriptors: *Nitrilotriacetic acid, *Chemical analysis, *Chemical reactions, *Pollutant identification, Organic acids, Industrial water, Metals,

cation, Organic acids, Industrial water, Metals, Oxidation, Detergents, Organic compounds, Catalysts, Selectivity, Aluminum, Chlorine, Iron, Calcium, Methodology, Manganese. Identifiers: Detection limits, Natural waters, Chemical interference, Sensitivity, Malachite green, Aminopolycarboxylic acids, Sodium lauryl sulfate, o-cresol, m-cresol, Iminodiacetic acid, Glycolic acid, Gl

The analytical use of the modifying effect of nitrilotriacetic acid (NTA) on the oxidation of Malachite Green cation by periodate ion, catalyzed by low concentrations of manganese (II) ions has been extended to the detection and determination of NTA. A variable time kinetic method of analysis has been developed which allows detection and determination of ppm and fractions of ppm of NTA. This method uses photometric monitoring and digital electronic collection of the time clapsed as the system evolves between two ioring and digital electronic collection of the time elapsed as the system evolves between two preestablished chemical compositions. The effect of some metal ions, other aminopolycarboxylic acids, some products of degradation of NTA, and some other species expected to be present in detergent formulations, natural water, and industrial waters was also evaluated. Iminodiacetic acid, glycolic aci iron (III) ion did not interfere if present at the same molar level of NTA. Aluminum ion and sodium lauryl sulfate can be tolerated in molar concentrations 10 times that of NTA. Dissolved chlorine trauous to times that of N1A. Dissolved chlorine proved to be the only serious interference of all species considered. The procedure compares well in detectability, sensitivity, and selectivity with those previously published and is easily amenable to monitoring and repetitive analysis. (Holoman-Battella) Battelle) W73-07636

SYSTEMATIC APPROACH TO THE STUDY OF AROMATIC HYDROCARBONS IN HEAVY DISTILLATES AND RESIDUES BY ELUTION ADSORPTION CHROMATOGRAPHY, Gulf Research and Development Co., Pittsburgh,

D. M. Jewell, R. G. Ruberto, and B. E. Davis.

Analytical Chemistry, Vol 44, No 14, p 2318-2321, December 1972. 7 fig, 3 tab, 7 ref.

Descriptors: "Separation techniques, "Methodology, Pollutant identification, Oil, Organic compounds, Waste identification, Adsorption. Identifiers: "Petroleum residues, "Gradient elution chromatography, "Oil characterization, "Petroleum distillates, Aromatic hydrocarbons, Petroelum products, Crude oil, Kerosene, Gas oil, Volatility, Organic solvents.

More significant approaches to isolating aromatic hydrocarbons from heavy distillates (greater than 400 F) and residuals are being devised as a result of recently established pretreatment methods which remove the major nonhydrocarbon impurities and saturates. Exponential gradient elution aborption chromatography (GEC) coupled with multiple on-line detectors (e.g., dual-channel ultraviolet) can then be used for a rapid classification into mono; di., tri., and polyaromatic subfractions. The separation procedure involves the use of 2 columns which are rapidly dry-packed with zero percent H20-A1203 and sealed. Traces of water are moved by in situ heating at 200 C under a nitrogen purge and pure n-hexane is pumped throughout the system in order to equilibrate each detector. The aromatic concentrate-hexane mixture is injected onto the sample column and the absorbance is read by ultraviolet monitors using spectral grade solvents (cyclohexane chloroform and methanol). Higher the absorbance is read by ultraviolet monitors using spectral grade solvents (cyclohexane chloroform and methanol). Higher the absorbance is read by ultraviolet monitors using spectral grade solvents (cyclohexane chloroform and methanol). Higher the absorbance is read to the sample of the properties of the column and the absorbance is read by ultraviolet monitors using spectral grade solvents (cyclohex-ane, chloroform, and methanol). Using the above method, (1) any overlap of saturates in the aromatic concentrates can be determined; and (2) the presence of the heteroatom does not affect the monaromatic-diaromatic separation when high sulfur aromatic concentrates are separated. The GEC has been found satisfactory for aromatic concentrates from kerosene, cracked or virgin gas oils, FCC feedstocks, and residuals. The only limitation is volatility since chloroform and methanol must FCC feedstocks, and residuals. The only limitation is volatility since chloroform and methanol must be removed from the polyaromatics. The method is rapid, flexible, and can be made analytical with appropriate micro columns and detectors. The total sequence of steps described provides an analytical and quantitative approach to the following major classes of compounds: acids, bases, neutral nitrogen compounds, total saturates, total aromatics, monoaromatics, di plus triaromatics, and polyaromatics. (Holoman-Battelle) W73-07637

DEVELOPMENT OF METHOD FOR NTA ANALYSIS IN RAW WATER, National Bureau of Standards, Washington, D.C. J. K. Taylor, W. L. Zielinski, Jr., E. J. Maienthal, R. A. Durst, and R. W. Burke.
Copy available from GPO Sup Doc as EP123/2:72-057, \$0.70; microfiche from NTIS as PB-219 035, \$0.95. Technology Series, Environmental Protection Agency, Report EPA-R2-72-057, September, 1972. 27 p, 9 fig, 2 tab, 12 ref. EPA Project 16020 GVY.

Descriptors: *Nitrilotriacetic acid, *Methodology, *Water analysis, *Polarographic analysis, *Pollutant identification, Chemical analysis, Lead, Cadmium, Detergents, Gas chromatography, Reliability, Turbidity, Electrochemistry, Waste identification, Copper, Jons, Organic acids. Identifiers: *Jon selective electrodes, *Potentiometric titration, *Flame ionization gas chromatography, *Trace levels, Metal-NTA complexes, Bismuth, Chemical interference, Sensitivity, Jonic interference, N O-bis (trimethylsily)acetamide, Chelated metals.

The free acid form of nitrilotriacetic acid is readily esterified by N₁O-bis (trimethylsily)lacetamide and gas chromatographic analysis is directly applicable to this derivative. The response characteristic of NTA-trisilylester was 2,200 sq mm peak area per microgram of NTA at maximum sensitivity of the hydrogen filame ionization detector. Accordingly, gas chromatography has the potential for detecting NTA concentrations of practical in-

terest providing that suitable NTA isolation techniques can be developed. The cupric ion-selective electrode provides the basis for a sensitive electrochemical detector for NTA. Apparatus for the on-stream determination of uncomplexed NTA has been developed. This may be used for determination of total NTA, after the latter is senarated from bound metal ions and other comdetermination of total NTA, after the latter is separated from bound metal ions and other complexing agents by a suitable means, such as ion-exchange chromatography. Polarographic studies have shown that the bismuth-NTA complex is a suitable method for determination of NTA in most waters. While some metal ions may interfere, a pre-electrolysis step and/or a standard addition technique seems feasible to eliminate this problem. Potentiometric titration with cupric ion should provide a rapid and reliable referee method for the determination of NTA in detergent formulations. Such a method would appear to be superior to the spectrophotometric methods presently used, since the latter are affected by turbidities which are encountered in many of the samples (Holoman-Battelle)

ENVIRONMENTAL RADIOACTIVITY IN THE ENVIRONMENTAL RADIOACTIVITY IN THE FARCES IN 1971,
Danish Atomic Energy Commission, Risoe (Denmark). Health Physics Dept.
A. Aarkrog, and J. Lippert.
Available from NTIS, Springfield, Va., as Riso Report No. 266, \$3.00 paper copy, \$0.95 microfiche. Riso Report No. 266, July 1972. 20 p, 8 fig, 17 tab, 5 ref.

*Strontium, Descriptors: *Fallout, *Cesium, Descriptors: "Failout, "Cesum, "Strontum, "Measurement, "Environment, Air pollution, Water pollution, Food chains, Diets, Toxicity, Drinking water, Sea water, Vegetation, Public health, Assay, Data collections, Sampling. Identifiers: "Faroes.

Measurements of fall-out radioactivity in the Faroes in 1971 are presented. Sr-90 (and Cs-137 in most instances) was determined in regularly collmost instances) was determined in regularly coll-lected samples of precipitation, grass, milk, lamb, fish, sea water, bread, and drinking water. In addi-tion, analyses of spot samples of potatoes, sea plants, vegetables, eggs, and human bone were carried out. Estimates of the mean contents of the Sr-90 and Cs-137 in the human diet in the Faroes in 1971 are given. (Houser-ORNL)

ISOTOPE HYDROLOGY IN LATIN AMERICA, International Atomic Energy Agency, Paris (France). Div. of Research and Labs. For primary bibliographic entry see Field 05B. W73-07762

IN THE STATE OF NEW JERSEY, New Jersey Dept. of Environmental Protection, Trenton. Div. of Environmental Quality. For primary bibliographic entry see Field 05B. W73-07770 1971 ENVIRONMENTAL RADIATION LEVELS

SURVEY OF ENVIRONMENTAL RADIOAC-TIVITY. Minnesota State Dept. of Health, Minneapolis. For primary bibliographic entry see Field 05B. W73-07771

C-14 CONCENTRATIONS IN THE SOUTHERN OCEANS, Washington Univ., Seattle. Dept. of Chemistry. A. W. Fairhall, P. Bradford, and A. W. Young. Available from NTIS, Springfield, Va., as RLO-2225-T-20-7, 33.00 per copy, 30.95 microfiche. Re-port RLO-2225-T-20-7, 1970. 4 p, 2 fig, 1 ref. Descriptors: "Radiation, "Carbon, "Assay, "Radioactivity, Fallout, Nuclear explosions, Diffusion, Sea water, Depth, Vertical migration, Pacific Ocean, Indian Ocean, Sampling, Data col-Identifiers: *Southern Oceans

Data for several stations on ELA TANIN cruises Data for severa stations on ELA LANGE CHOICE 38, 39, and 43 are given, where the absolute C14 concentrations are plotted as a non-linear function of depth. An educated guess for the specific radioactivity of the surface ocean prior to nuclear testing gives an estimate for the pre-1950 (natural) cesung gives an estimate for the pre-1930 (natural) C14 concentration of surface waters. Below 2000 m it was assumed that there is yet no perturbation by bomb C14. These assumptions led to the concusion that the natural C14 concentration in the southern oceans was 1.42 plus or minus 0.02 x10 to the 9th power atoms/liter independent of depth. The influence of bomb C14 to depths of 1000m was apparent. (Houser-ORNL)

ENVIRONMENTAL RADIOACTIVITY SUR-VEILLANCE GUIDE. VEILLANCE GUIDE.
Environmental Protection Agency, Washington,
D.C. Office of Radiation Programs.

Available from NTIS, Springfield, Va., as ORP/SID-72-2. \$3.00 per copy; \$0.95 microfiche. Report No ORP/SID-72-2, June 1972. 26 p, 6 fig, 3 tab, 39 ref.

Descriptors: *Nuclear powerplants, *Monitoring, *Effluents, *Regulation, Control, Air pollution, Water pollution, Soil contamination, Public health, Radioactivity, Toxicity, Safety.

Methods are recommended for conducting a minimum level of environmental radiation surveillance outside the plant site boundary of lightwater-cooled nuclear power facilities. An environmental surveillance program is presented to achieve uniformity so that the data will be compatible and the strength of achieve uniformity so that the data will be compatible and subject to singular interpretation relative to the estimated population radiation dose. The basic concepts presented may also apply to surveillance around other nuclear facilities such as gas-cooled and liquid-metal-cooled nuclear power facilities, and suclear fuel reprocessing plants. However, as additional nuclear facilities of these types are licensed and operated, additional guides may be needed. This Guide recommends procedures but does not establish the requirements for any particular organization for conducting environmental surveillance. (Houser-ORNL.) W73-07776

ACTIVATION ANALYSIS OF MERCURY IN ENVIRONMENTAL STUDIES, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Nuclear Chemistry.
T. Westermark, and B. Sjostrand.

In: Advances in Activation Analysis, Vol 2, Academic Press, London and New York, p 57-88, 1972. 6 fig, 6 tab, 73 ref.

Descriptors: "Mercury, "Food chains, "Marine fish, "Freshwater fish, Analytical techniques, Path of pollutants, Neutron activation analysis, Chromatography, Mass spectrometry, Pollutant identification, Trace elements, Toxicity, Sampling, Reviews, Monitoring, Ecology, Environmental effects, Water pollution, Physicochemical properties, Water analysis, Chemical properties, Soil contamination, Sediments.

Methods are reviewed that are used in geochemical, environmental, ecological, and medical applications. Nal (T1) is preferable to Ge (Li) as a detector for a more favorable geometry, although the latter gives resolution of the characteristic peaks at 68 and 77 kev. Correction is made for inter-

ference from Au196 and Pt191 on the basis of their other lines. Use of a Cd detector-liner in place of Pb avoids interference from P32-excited X-rays in biological samples. A 10-m1 sample was adequate for low levels in water. Levels in birds feeding on water plants were 10-fold higher than those feeding on fish in the same area. Chromatography in conjunction with mass-spectroscopy or thin-layer chromatography showed formation of methyl Hg from less toxic Hg compounds in food chains. (Bopp-ORNL)

RAPID DETERMINATION OF LOW-LEVEL ALPHA- AND BETA-ACTIVITIES IN BIOLOG-IC MATERIAL USING WET-ASHING BY OH RADICALS (SCHNELLE BESTIMMUNG SEHR RADICALS (SCHNELLE BESTIMMUNG SEHR
MIEDRIGER ALPHA- UND BETA-AKTIVITATEN IN BIOLOGISCHEM MATERIAL
NACH NA SSVERASCHUNG MIT OH-RADIKALEN),
Gesellschaft fuer Strahlen- und Umweltforschung
m.b.H., Neuberberg bei Munich (West Germany).
B. Sansoni, and W. Kracke.
In: Proceedings of an International Symposium,
Panid Methods for Measuring Radioactivity in the

B. Sanson, and w. Kracke.

In: Proceedings of an International Symposium, Rapid Methods for Measuring Radioactivity in the Environment, July 5-9, 1971, Neuherberg (Germany), p 217-231. 3 fig, 2 tab, 22 ref.

Descriptors: "Radiosctivity techniques, "Analytical techniques, "Radioscotopes, "Environmental effects, Monitoring, Radioecology, Biota, Separation techniques, Radiochemical analysis, Ion exchange, Oxidation, Incineration, Chemical degradation, Chemical reactions, Monitoring, Bioassay, Path of pollutants.

Identifiers: Polonium radioisotopes, Cesium radioisotopes.

Orangic material is prepared for beta counting or alpha spectrometry by peroxide-ferrous ion oxidation (without complete ashing), radiochemical concentration, and separation by ion exchange. Fish amples can be dissolved within 45 min. For Cs137, the radiochemical yield is about 70%, with a lower limit of about 6 pico-Curies/kg wet weight; for Po210, about 50-70%, with a lower limit of 0.1 picoCurie/kg. (See also W72-09437 and W72-0353.) (Bopp-ORNL)

AN INTERIM SUMMARY OF TRITIUM DATA FOR STS 'A', AMCHITKA ISLAND, ALASKA, JULY 1, 1970 THROUGH JUNE 30, 1971, Teledyne Isotopes, Las Vegas, Nev. For primary bibliographic entry see Field 05B. W73-07780

NEUTRON ACTIVATION TECHNIQUES FOR THE MEASUREMENT OF TRACE METALS IN THE MARINE ENVIRONMENT, Battelle-Pacific Northwest Lab., Richland, Wash. D. E. Robertson, and R. Carpenter. Available from NTIS, Springfield, Va., as BNWL-SA-4455; \$3.00 in paper copy; \$0.95 in microfiche. Report BNWL-SA-4455, Sept 1972. 71 p, 11 fig, 7 tab, 101 ref.

Descriptors: "Neutron activation analysis, "Pollutant identification, "Reviews," Trace elements, Instrumentation, Radiochemical analysis, Gamma rays, Spectrometry, Public health, Water analysis, Preshwater, Sea water, Bibliographies, Cadmium, Mercury, Copper, Arsenic compounds, Chromium, Zinc, Sediments, Biota, Atmospheric pollution, Water pollution, Estuarine environment, Analytical techniques, Separation techniques, Ion exchange. exchange. Identifiers: Silver, Antimony, Selenium

In this review, the use of gamma-ray spectroscopy in neutron-activation analysis is described generally, and the trace elements which can nor-mally be measured in various media are indicated.

Procedures are detailed, including preconcention and postirradiation separation when required in sections entitled fresh waters, sea water, many in sections entitled fresh waters, sea water marine organisms, sediments, and atmospheric particulates. A review of instrumentation is included in each section. Emphasis is placed on the measurement of hazardous trace metals (Hg, Cd, Cu, Ag, As, Sb, Cr, Se, and Za). The method is not sensitive for Pb and Sn. (Bopp-ORNL) W73-07781

AUTOMATIC LIQUID-PHASE RADIOANALYSER (RADIOANALYSEUR AU-TOMATIQUE EN PHASE LIQUIDE), ariat a l'Energie Atomique, Montrouge

(France).
J. Colomer, M. Cousigne, and G. Metzger.
In: Proceedings of an International Symposium,
Rapid Methods for Measuring Radioactivity in the
Environment, July 5-9, 1971, Neuherberg (Germany), p 249-261.7 fig, 17 ref.

Descriptors: "Radiochemical analysis, "Radioactivity techniques, "Monitoring, "Radioisotopes, Environmental effects, Path of pollutants, Nuclear wastes, Effluents, Strontium radioisotopes, Analytical techniques, Separation techniques, Stable isotopes, Cation exchange, Solvent extractions, Automation, Chelation. Identifiers: Molybdenum radioisotopes, Barium radioisotopes.

Low levels of radioisotopes (Mo99, Sr89, and Low levels of radioisotopes (2007), 5769, and Bal40) were analyzed by dilution with the cor-responding stable element. The radioactivity trapped by either a chelating or an ion-exchange agent was measured before and after dilution. Less than the stoichiometric quantity of trapping agent was used in order that the same quantity of element was trapped in both instances. Automa-tion gave greater speed than obtainable by other methods. Application to other radioisotopes is discussed. (See also W72-09437 and W72-05353.) (Bopp-ORNL) W73-07784

TOC: HOW VALID IS IT, Beckman Instruments, Inc., Fullerton, Calif. For primary bibliographic entry see Field 05B.

DETERMINATION OF PHOSPHATE IN SEA-WATER BY AN ISOBUTYL-ACETATE-EXTR-ACTION PROCEDURE, Australian Atomic Energy Commission Research Establishment, Lucas Heights. P. Pakalns, and B. R. McAllister.

Journal of Marine Research, Vol 30, No 3, p 305-311 1972 2 tab 9 ref

Descriptors: "Phosphates, "Phosphorus com-pounds, "Sampling, Separation techniques, Aque-ous solutions, Saline water, Freshwater, Arsenic, Silicates, Water quality, Water pollution, *Pollutant identification.

Identifiers: *Isobutyl-acetate procedure, *Inorganic phosphates.

Methods are described for determining the quanti-ty of inorganic phosphate and total phosphorus in seawater by extracting the molybdophosphoric acid with isobutyl acetate and by then reducing the solution to heteropoly blue. Amounts of arse and silicate ordinarily encountered in seawater do not interfere. The method can be used with slight modification for fresh water samples. (Smith-Tex-

Group 5B—Sources of Pollution

5B. Sources of Pollution

ESCHERICHIA COLI SEROTYPES IN MICROBIAL POLLUTION OF WATER, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. For primary bibliographic entry see Field 05A. W73-07160

INFLUENCE OF FERTILIZATION AND CROPS ON NITRATE CONTENT OF GROUNDWATER AND TILE DRAINAGE EFFLUENT, Clemson Univ., S.C. Dept. of Agronomy and

1. C. Peele, and J. T. Gillingham.

South Carolina Water Resources Research Institute Report No 33, 1972. 20 p, 7 tab, 13 ref.

OWRR Report S-036-SC (1).

Descriptors: *Path of pollutants, Water pollution sources, *Nitrogen, *Nitrates, *Groundwater, *Fertilizers, Soils, Drainage, Crops.

Ammonium nitrate was added to a Dunbar sandy loam soil in June at the rates of 0, 100, 300, and 600 pounds N per acre. The soil was maintained free of plant growth by frequent diskings. The indicated residual NO3-N from the fertilizer, in the 0-to 41-inch death of soil the following March, was inch depth of soil the following March, was apinch depth of soil the following March, was approximately 34, 140, and 172 pounds per acre for the 100, 300, and 600 pounds application rates respectively. The NO3-N in the groundwater in August was 21.4, 32.8, 101.3, and 88.5 ppm for the 0, 100, 300, and 600 pounds per acre rates of applied nitrogen and the following June the NO3-N for these same rates was 5.0, 13.8, 33.1, and 25.4 ppm respectively. The NO3-N content of effluents from 13 tile lines draining fields of soybeans, cotton, corn and tobacco located on Norfolk, Dunbar and Coxyille soils was determined periodically ton, corn and tobacco located on Norfolk, Dundar and Coxville soils was determined periodically during the period from July 15, 1971 to June 22, 1972. The average NO3-N for a given sampling date ranged from a low of 0.61 ppm on July 15 to a high of 14.9 ppm on February 17. The mean for the 10 sampling times was 4.8 ppm.
W73-07173

SUCCESSIVE DISPLACEMENTS OF (3) H2O AND (36) NACL THROUGH STERILIZED AND UNSTERILIZED SOIL COLUMNS, Florida Univ., Gainsville.
For primary bibliographic entry see Field 02G. W73-07229

BACTERIAL ORIGIN OF SULFURIC ACID IN GEOTHERMAL HABITATS, Wisconsin Univ., Madison. Dept. of Bacteriology. For primary bibliographic entry see Field 02K. W73-07233

FLOOD SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 02E.

FLOW DYNAMICS, REGIME, THEORY, AND METHODS OF COMPUTATION AND MEA-SUREMENT OF SEDIMENTS AND WASTE WATER (DINAMIKA POTOKOV, REZHIM, TEORIYA, METODY RASCHETA I IZ-MERENIYA NANOSOV I STOCHNYKH VOD). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-07257

PROBLEMS IN THE THEORY OF LAMINAR AND SEDIMENT- AND WASTEWATER-CARR-YING TURBULENT CHANNEL FLOWS (VOPROSY TEORII DVIZHENIYA RUS-LOVYKH POTOKOV --TURBULENTNYKH, PEREMESHCHAYUSHCHIKH NANOSY I PEREMESHCHAYUSHCHIKH NANOSY PRIMESI, I LAMINARNYKH), Gosudarstvennyi Gidrologicheskii Institut, Lenin

grad (USSR).
For primary bibliographic entry see Field 02J.
W73-07259

EXPERIMENTAL VALIDATION OF PERMISSI-BLE CONCENTRATION OF DIANATE AND 2,3,6-TRICHLOROBENZOIC ACID IN WATER BODIES, Kiev Research Inst. of General Communal Hy-

giene (USSR). For primary his

ary bibliographic entry see Pield 05C. W73-07281

HYGIENIC STANDARDS FOR LEAD AND CYANIDE SIMULTANEOUSLY PRESENT IN WATER BODIES, Research Inst. of Hygiene, Sofia (Bulgaria). For primary bibliographic entry see Field 05C. W73-07282

FLUORINE IN DRINKING WATERS OF THE KHARKOV REGION, Regional Sanitary-Epidemiological Center, Khar-

Regional Sar kov (USSR). V. I. Lukash

Available from the Nation nal Technical Inform Avanage from the National Technical Informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 106-108, October-December, 1970. I tab, 2 ref. Trans from Gigiena i

Descriptors: *Fluorine, *Potable water, *Water supply, *Organoleptic properties, Subsurface waters, Mineral water, Artesian wells, Chemical analysis, Water quality, Public health. Identifiers: USSR, *Kharkov region.

The amount of fluorine in drinking waters from various sources in the Kharkov Region was deter-mined by a colorimetric method. Results showed orine concentrations up to 0.5 mg/1 ocan 31.570 or the pit wells and 36.8% of the artesian wells. The low fluorine concentrations in the drinking water of certain districts in the region was the principal factor conductive to high prevalence of cavities. (Smith-Texas) W73.07283 curred in 51.5% of the pit wells and 36.8% of the

EFFECTIVENESS OF SUBSURFACE FILTRA-TION BEDS WITH RESPECT TO SALMONELgiene (USSR).
For primary bibliographic entry see Field 05D.
W73-07284 Kiev Research Inst. of General Communal Hy-

HYGIENIC STANDARDS FOR BISMUTH IN

WATER BODIES, Institut Gigieny Truda i Profzabolevanii, Sver-dlovsk (USSR).

N. N. Petrova, L. N. El'nichnykh, K. P. Selyankina, V. G. Lenchenko, and A. A. Petina. Available from the National Technical Inform Available from the National Technical Informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 161-164, October-December, 1970. 2 tab. Trans from Gigiena i

Descriptors: "Bismuth, "Water quality control, Water quality, Water pollution effects, Water pollution sources, "Toxicity, Organoleptic properties, "Industrial wastes, "Effluents.

Identifiers: USSR.

The objective was to determine the maximum permissible concentration in effluents of bismuth compounds. The bismuth contents of effluents from copper electrolyte plants that were discharged into the surface water bodies fluctuated from 1.0 to 8.0 mg/l. An experiment conducted to determine the sanitary toxicologic effects proved that the pentavalent bismuth compounds were more toxic than the trivalent ones. The maximum permissible concentration of the pentavalent bismuth of the sanitary toxicologic effects proved that the pentavalent of the maximum permissible concentration of the pentavalent bismuth was set at a level of 0.1 mg/l and that of trivalent bismuth at 0.5 mg/l. (Smith-Texas) Texas) W73-07287

DISTRIBUTION OF PROTEUS IN VARIOUS EF-FLUENTS, Nauchno-Issledovatelskii Institut

Moscow (USSR). G. P. Kalina.

G.P. Kauna.

Available from the National Technical Informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 263-268, October-December, 1970. 1 tab, 8 ref. Trans from Gigiena i

Descriptors: "Bacteria, "Indicators, "Industrial wastes, Water pollution, Water pollution sources, Water pollution control, Water quality, Water quality control, Analytical techniques, Pollutant identification, Food processing industry.

Identifiers: "Meat packing industry, "Proteus, "INSOP" *IISSR

An investigation was conducted using a bile-citrate culture medium to determine the possible significance of Proteus as an indicator organism. Three types of effluents from a meat packing plant were investigated: (1) effluents from the slaughterhouse in the area used for the dressing of carcasses; these effluents contained a mixture of feces, urine and organic residues; (2) the same effuents after leaving the grease trap; and (3) non-industrial effluents from other areas in the grounds of the meat packing plant; that is from the sheds for slaughter animals, from open areas following rain, from washing in the trucks; etc. Distribution of the different species of Proteus is shown in a table. A relatively high content of Proteus vulgarius was found in the industrial effluents of the meat packing plant while there was a preponderance of Proteus mirabilis in effluents with a predominance of edaphic and fecal microorganisms. (Smith-Texof edaphic and fecal microorganisms. (Smith-Texas) W73-07289

SIMPLIFIED TECHNIQUES FOR DETERMINA-TION OF THE SIZE OF SANITARY ZONES AROUND INTAKES OF SUBSURFACE WATERS, Moskovskii Gosudarstvennyi Meditsinskii Institut

Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Environmental Hygiene. S. N. Cherkinskii, and E. L. Minkin. Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 305-313, October-December, 1970. 4 fig, 2 tab, 7 ref. Trans from Gigiena i Sanitariya.

Descriptors: "Groundwater, "Subsurface waters, "Pumping, "Mathematical studies, Industrial wastes, Organic wastes, Water pollution, Water pollution sources, Water quality.

Identifiers: "USSR, Water intakes, "Sanitary

The use of special calculation methods in the determination of the size of sanitary zones is necessitated by the differences in hydrological conditions and other factors. A zone must be resent around the intakes of subsurface waters to

will take so long to move to the water intake that the pathogenic microorganisms will lose their via-bility and virulance. Next, to protect the water against stable mineral industrial pollutants and toxic organic substances, a second sanitary zone toxic organic substances, a second sanitary zone must be wide enough to insure that the pollutant will never reach the water intake itself. Therefore, on the basis of modern hydrodynamic and graphicanalytic calculations, simple and available means of determining the boundaries of the second zone of the sanitary belt around the sites of underground water intakes are described. (Smith-W73.07200) W73-07290

HYGIENIC EVALUATION OF SANITARY MEASURES FOR THE LUGAN AND OLK-HOVAYA RIVERS IN THE VOROSHILOV-

GRAD AREA,
Municipal Sanitary-Epidemiological Center,
Voroshilovgrad (USSR).
M. S. Burakhovich, S. G. Puchkova, and A. S.

Kolesnikov.

Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 10-12, p 409-411, October-December, 1970. Trans from Gigiena i Sanitariya.

Descriptors: Water pollution, "Water pollution control, Water pollution sources, Water quality, 'Industrial wastes, Municipal wastes, Waste water treatment, Effluents, Laboratory tests, Pollution abatement, Pollutants, Public Health. Identifiers: USSR, *Lugan River (USSR), *Olkhovaya River (USSR), Voroshilovgrad area.

In view of the scantiness of water in the Lugan and Olkohovaya Rivers in the Voroshilovgrad area, the public health services have concentrated on preventing their further pollution. All industrial and communal undertakings were surveyed. The formation of effluents, their treatment, and the discharge sites were studied; furthermore, the effuents were inventoried and their qualifie and their qualifier and their fluents were inventoried and their quality and that of the River water were monitored by laboratory tests. The data gathered confirm the hygienic effitests. The data gathered confirm the hygienic effi-ciency of measures for improving the sanitary state of the Lugan and Olkhovaya Rivers that was implemented in Vorshilovgrad in 1959 through 1968. Several indices of the quality of water in the rivers downstream of all the discharge sites of Voroshilovgrad are not inferior to those of control stations upstream of the city and the industrial en-terprises, contrary to what might be expected in large industrial centers. (Smith-Texas) W73-07293

TOXICOLOGICAL CHARACTERISTICS OF PHATHALOPHOS AND ITS PERMISSIBLE LEVEL IN WATER BODIES, Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Tokaikologii Pestitsidov, Kiev (USSR). K. K. Vrochinskii, and L. P. Danilenko. Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 10-12, p 414-416, October-December, 1970. 1 ref. Trans from Gigiena i Sanitarios.

Descriptors: "Pesticides, Agriculture, Water pol-lution sources, Pollution, "Toxicity, Water quality control, Organoleptic properties, Laboratory tests, Water pollution effects. Identifiers: "USSR, "Phathalophos.

An investigation was conducted to determine the maximum permissible concentration of phathalophos in water bodies by studing its toxicological characteristics and its organoleptic properties. The data from the toxicological studies indicate that phathalophos can be classified as a highly toxic compound in oral administration. The results make it possible to recommend that the

maximum permissible concentration of phathalophos in water bodies be fixed at 0.2 mg/1. (Smith-Texas) W73-07295

EFFECT OF A MIXTURE OF RADIOACTIVE ISOTOPES ON THE SANITARY REGIME OF WATER BODIES, For primary bibliographic entry see Field 05C. W73-07297

BORON CONCENTRATIONS IN DRINKING WATERS OF THE ARMENIAN SSR, Institute of General and Municipal Hygiene, Moscow (USSR). T. S. Khachatryan.

Moscow (USSR).
T.S. Khachatryan.
Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 118-120, July-September, 1970. 1 fig, 6 ref. Trans from Gigiena i Sanitariya.

Descriptors: *Boron, Water pollution control, *Water pollution sources, Water pollution effects, Water quality, Organoleptic properties, Salinity, *Potable water, Water supply, Pollutant identifica-tion, *Public health. Identifiers: USSR, *Armenia.

The data of the toxicology of boron indicate a need to study its concentration in the drinking waters of different regions of the USSR. Sampling for boron took place in drinking waters from 110 sources in nearly all districts of the Armenian republic. Boron concentrations were determined by the extraction photometric method. The replication error was 3%. The saline composition of the water was also investigated. When boron concentrations were compared with the salinity of the waters, the results showed that high boron concentrations were more common in the more mineralized waters but also there was no direct correlation. waters but also there was no direct correlation.
(Smith-Texas) (Smith-Tex W73-07299

RESISTANCE OF ENTEROCOCCI TO CHLORINE IN DISINFECTION AND PURIFICATION OF WATER IN WATERWORKS, Rublevo Waterworks, Moscow (USSR). For primary bibliographic entry see Field 05F. W73-07300 RESISTANCE OF ENTEROCOCCI

SURVIVAL OF DYSENTERY PATHOGENS IN WELL WATER, N. P. Masharipov

N. P. Masharipov. Available from the National Technical Informa-tion Service as part of TT70-50048/3, \$3.00 as paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 7-9, p 146-147, July-Sep-tember, 1970. Trans from Gigiena i Sanitariya.

Descriptors: Sampling, Water pollution sources, *Bacteria, *Pathogenic bacteria, Water quality, Groundwater, Temperature, *Water wells. Identifiers: *USSR, *Dysentery microbes, *Sur-

The survival time in water of local strains of dysentery bacteria was determined. Water sam-ples were taken from a well with heavily polluted samples were simultaneously subjected to bac-teriological and chemical investigations using conal methods. The results indicate that the survival time of dysentery microbes in water desurvival une or dysenery microses in water de-pends upon the temperature of the water and the degree of it contamination. Survival times in-creased 50 to 100% in relatively pure well water and increased over 500% in boiled water. (SmithINDUSTRIAL POLLUTANTS IN WATER

Available from the National Technical Informa-tion Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 158-160, July-Sep-tember, 1970. Trans from Gigiena i Sanitariya.

Descriptors: Water pollution, Water pollution sources, Water pollution effects, Water quality,
*Organoleptic properties, Water quality control,
Pesticides, Organic water, Organic matter,
Chemical wastes, Industrial wastes, Phenols, Pollution abatement, Plastics, *Industrial wastes.
Identifiers: *USSR, *Chemical pollutants,
*Agricultural poisons.

This is a collection of papers (edited by S. N. Cherkinski, associate member of the USSR Academy of Medical Sciences, Moscow, No. 9, 1969), presenting the results of comprehensive experimental studies of substances used for or produced during the manufacture of agricultrual poisons, synthetics, plastics, and other organic chemical products. A multitude of physiological and biochemical tests were used by the authors thus revealing the effects of these substances on various systems and organs of the experimental animals with a high degree of reliability. The majority of the papers do not deal with single chemical pollutants, but with groups of similar substances, and their combined effect in water. (Smith-Texas)

A CALCULATION METHOD FOR DETERMIN-ING THE QUALITY OF SEA WATER POL-LUTED BY EFFLUENTS,

LUTED BY EFFLUENTS,
Tallin Polytechnic Inst. (USSR).
A. M. Aitsam, Kh. A. Vel'ner, and L. L. Paal.
Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in
paper copy, \$0.95 in microfiche. Hygiene and
Sanitation, Vol 25, Nos 7-9, p 193-200, July-September, 1970. 7 fig, 1 ref. Trans from Gigiena i
Sanitariya.

Descriptors: *Mathematical studies, Water pollution, *Water quality, *Waste disposal, Turbulence, Turbulent flow, Pollution abatement, Effluents, Municipal waste, Biochemical oxygen demand, Sea water. Identifiers: *USSR, *Sea water pollution

Simple calculated relationships governing the dilution and transformation of pollutants in water bodies based on the semi-empirical theory of turbulent eiffusion are presented for convenience in the form of nomograms. Furthermore, the principal technical economic calculations needed to determine the required degree of purification of effluents discharged into the sea at a deep level are outlined. (Smith-Texas)

PERSPECTIVE ON THE PROBLEM OF CAR-CINOGENIC POLLUTION IN WATER BODIES, Institut Eksperimentalnoi i Klinicheskoi On-

CINGENIC POLLUTION IN WATER BODIES, Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).

L. M. Shabad, and A. P. Il'nitskii.

Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 7-9, p 268-273, July-September, 1970. 24 ref. Trans from Gigiena i Sanitariya.

Descriptors: Water pollution, *Water pollution sources, *Water quality control, *Industrial wastes, Research and development, Fossil fules, *Organic compounds, Effluents.

Identifiers: *Carcinogenic hydrocarbons, *USSR.

At the beginning of the 1950's, reports appeared on the carcinogenic properties of absorbates from

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water sources polluted with industrial effluents water sources pointed with industrial effluents and reports appeared on the possible accumulation of carcinogenic hydrocarbons including 3, 4-benz-pyrene in certain water bodies. The main trend of Soviet investigations in this field has been to study industrial enterprises engaged in the processing of fossil fuels since this is one of the main sources of water pollution. rossu ruers since this is one or the main sources of water pollution by carcinogenic hydrocarbons. Numerous schemes and methods for research are described. It is emphasized that a true solution will not be reached as long as the problems of carcinogenic contamination of water are dealt with in isolation. (Smith.Tava) cinogenic contamination isolation. (Smith-Texas)

CHARACTERISTICS OF COLIFORM BACTERIA ISOLATED FROM DRINKING WATER AND THEIR INDICATOR VALUE, Municipal Sanitary-Epidemiological Center, Zaporozhe (USSR).

Zaporozhe (USSR).
V. E. Voronkin, and A. Yu. Shtein.
Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 299-300, July-September, 1970. 3 ref. Trans from Gigiena i Sanitariya.

Descriptors: *E. coli, *Coliforms, *Bacteria, Water pollution sources, Water pollution control, Water quality control, *Potable water, Water supply, Public health. Identifiers: *Paracolon bacilli, *USSR.

A study was conducted of coliform bacteria iso lated from drinking water with the purpose of at-taining an integrated hygienic characterization based on the determination of groups. The coli titer infringements during the summer and autumn months when the percentage of coli titer deviations was at its maximum were mainly due to paracolon bacilli. The investigation revealed that E. coli communae was responsible for 22.6% of the infringements of the State Standard recommendation, while coliform bacteria were responsi-ble for the remaining 77.4%. (Smith-Texas)

RAPID CALCULATION METHOD FOR ESTI-MATING DILUTION OF EFFLUENTS IN RIVERS.

Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche

Descriptors: *Turbulent flow, *Turbulence, *Effuents, River flow, Water pollution, Mathematical models, Mathematical studies, Pollution abatement, Water pollution sources, *Dilution, *Diffu

Identifiers: Pollution concentration, USSR.

The calculation method proposed for estimating the dilution of effluents in rivers is based on the tion of the differential equation of turbulent diffusion in the form of finite differences for a flat model of the phenomena. The calculations elu-cidated the relationship between the intesity of decrease in the maxium concentration and the hydraulic characteristics of flows and yielded the distribution of the concentration of pollutants along the river length. (Smith-Texas)

HYGIENIC EVALUATION OF AMYL, PRIMA-RY AND SECONDARY OCTYL ALCOHOLS IN RELATION TO THEIR STANDARDS IN

RELATION 10 RESEARCH STATES OF THE STATES OF (I) (USSR). Dept. of Environmental Hygiene. For primary bibliographic entry see Field 05C.

EFFECT OF VITAMIN B12 ON THE SANITARY REGIME OF A WATER BODY, Regional Sanitary-Epidemiological Center, Volo

da (USSR).

da (USSR).

V. F. Karpukhin, and G. B. Shteinberg.

Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in
paper copy, \$0.95 in microfiche. Hygiene and
Sanitation, Vol 35, Nos 7-9, p 472-473, July-September, 1970. Trans from Gigiena i Sanitariya.

Descriptors: Vitamin B, *Color, *Organoleptic properties, *Biochemical oxygen demand. Laboratory tests, Water pollution, Water pollution sources, Water quality control. Identifiers: *Vitamin B12, *USSR.

The stability of vitamin B12 in a water body and its The stability of vitamin B12 in a water body and its influence on organoleptic properties and B0D dynamics were investigated. Known concentrations of vitamin B12 (10 mg/l) were produced in experimental vessels using distilled water as the control and an experimental period of 30 days. Based on its affect on color, the threshold vitamin B12 concentration with respect to the organoleptic properties of water is 0.1 mg/l. There was no apparent B0D inhibition in any of the samples. Therefore, the effect of vitamin B12 on the color of water was found to be the determining criterion in its threshold concentration. The threshold conof water was found to be the determining criterion in its threshold concentration. The threshold concentration of the vitamin on this basis, that is 0.1 mg/l, was also the threshold concentration with respect to its effect on the sanitary regime in the water body. (Smith-Texas)

PRIVY VAULT WASTE STUDY,

P. L. Shepherd. Contract Report for October 1971. 6 p, 1 fig, 1 tab. Forest Service Contract 003344N.

Descriptors: "Water pollution sources, "Recreation wastes, "Sewage, "Camping, "Waste disposal, Chemical analysis, Hydrogen ion concentration, Chemical oxygen demand, Biochemical oxygen demand, Solid wastes, Data collections, Costs, Evaluation, "Washington. Identifiers: "Snoqualie National Forest.

The composition of privy vault pumping wastes from Forest Service recreation sites located in from Forest Service recreation sites located in Tieton Administrative site and Hause Creek Campground of the Snoqualie National Forest, Yakima County, Washington, was studied through an existing privy cleaning system. At least two representative samples for pH, suspended solids, total solids, biochemical oxygen demand, and chemical oxygen demand were analyzed. The privy system and cleaning operation was observed by a sanitary engineer. The chemical oxygen demand results showed a high amount of organic material (6.9 to 12.7%) most of which is quite likely represented by organic solids. Thus, the slurried material (6.9 to 12.7%) most of which is quite likely represented by organic solids. Thus, the slurried privy vault contents are estimated to contain between 5 and 10% solids. A bid price by a septic tank pumping company is \$20.00 per vault. Estimating the cost of the technician and pickup at \$36.00 for 9 hours, the average cost per vault then becomes \$20.00 plus one-sixth of \$36.00 or a total of \$26.00. The pumper operator has a demeaning, heavy, and hazardous job. A better and cheaper way should be found to operate the system. For example, the privy vault waste could be handled as a solid waste with disposal at the nearest sanitary landfill. (Woodard-USGS)

ENVIRONMENTAL IMPACT EVALUATION OF HAZARDOUS WASTE DISPOSAL IN LAND.

HAZARDOUS WASTE DISPOSAL IN LAND, Louisville Univ., Ky. J. L. Pavoni, D. J. Hagerty, and R. E. Lee. Water Resources Bulletin, Vol 8, No 6, p 1091-1107, December 1972. 2 fig. 8 ref.

Descriptors: Waste disposal, *Solid wastes, Toxicity, Toxins, Materials, Groundwater, *Ground-

water movement, Pollutants, Sites, Environmental effects, Priorities, Population, *Landfills.

Identifiers: Design parameters, *Hazardous

In recent years, scientific findings on the ecological effects of various hazardous substances have posed several important questions. What exactly are hazardous wastes. Can these substances be disposed of in a technically feasible, economical, and safe way with assurance that they have been permanently eliminated from the ecosystem. What compositional alterations or movements of the hazardous wastes occur in soil, water, or air systems. What effects will these wastes have on the water, soil, or air systems. What effects will these wastes have on water, soil, or air propertie A refinement of the priority of concern rating systems is offered, hopefully to provide a sound basis from which procedural decisions may be structured to establish future national hazardous waste disposal sites. A thorough definition of hazardous wastes is presented. The final numerihazardous wastes is presented. The Imai numeri-cal ranking of a specific hazardous compound is shown to be representative of its potential threat to the environment, and therefore indicates the priority it should receive with respect to other sub-stances. The final numerical ranking of a specific landfill site will provide an indication as to the feasibility of disposing of hazardous substances at that site. (Smith-NWWA) W73-07336

ENVIRONMENTAL GEOCHEMISTRY HEALTH AND DISEASE.

Geological Society of America, Boulder, Colorado, (Memoir 123) 1971. H. L. Cannon and H. C. Hopps, editors 230 p. American Association for the Advancement of Science Symposium, Dal-

Descriptors: Groundwater, *Geochemistry, Hard-Descriptors: Orbaniwaser, Germanness (Water), Calcium carbonate, Cadmium, Chromium, Asbestos, Lead, Molybdenum, Nickel, Strontium, Zinc, Pathology, *Diseases. Identifiers: Plant chemistry, *Deficiency diseases.

An interdisciplinary symposium on Environmental Geochemistry in Relation to Human Health and Disease was held on December 30, 1968, in Dallas, Texas, at the Annual Meeting of the American Association for the Advancement of Science. The purpose of the symposium was to show that the chemistry of rocks, soils, plants, and water in a particular geographic environment may be causally related, either directly or indirectly, to the occurrence of animal and human diseases. The data presented are representative of the state-of-knowledge in the field of geochemistry concerning ution of elements in various types of the substrata, the dispersal of these chemical constituents in soils and water during weathering and their absorption by plants. With respect to biomedical problems, the information concentrates on medical ecology and the importance of geographic pathology in determining cause-effect relationships. Specifically, relationships of zinc to body growth and wound healing; cadmium and hardness of water to heart disease; lead to multiple sclerosis; chromium to diabetes; molybdenum and strontium to dental caries; nickel, cadmin chromium, and asbestos to cancer; and molyb-denum to molybdenosis of cattle, are discussed in some detail. (Campbell-NWWA) W73-07346

SUBSURFACE WASTE STORAGE-THE EARTH SCIENTIST'S DILLEMMA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05E.

INJECTION WELLS AND OPERATIONS TODAY, Bureau of Mines, Bartlesville, Okla. For primary bibliographic entry see Field 05E. W73-07357

RADIOCHEMICAL ANALYSES OF WATER SAMPLES COLLECTED AFTER THE SALMON EVENT IN THE VICINITY OF TATUM SALT DOME, LAMAR COUNTY, MISSISSIPPI, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05A.

OCEANOGRAPHIC OBSERVATIONS IN MON-TERRY BAY, CALIFORNIA, FEBRUARY 1971 TO DECEMBER 1971, Moss Landig Marine Labs., Calif. For primary bibliographic entry see Field 07C. W73-07382

ARCTIC WINTER OIL SPILL TEST, UNITED

STATES COAST GUARD,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.

Technical Bulletin No 68, 1972. 20 p, 16 fig, 2 tab,

Descriptors: *Oil spills, *Cold regions, *Snow, *Ice, Physical properties, Testing procedures, Winter, Alaska, Dispersion, Diffusion, Snow cover, Data collections, Thawing, Sampling, Research equipment, Path of pollutants. Identifiers: Crude oil.

As part of an arctic pollution control program, the U.S. Coast Guard conducted a series of oil spill tests off the northern coast of Alaska during the winter of 1972. Its purpose was to investigate the physical properties of crude oil spilled in an arctic winter environment. The test took place at Port Clarence, a small peninsula on the Bering Strait, January 14 to February 4. Samples of the spilled oil were collected daily from snow and ice and achieved for dentity surface learners and viscosi. oil were collected daily from snow and nee and analyzed for density, surface tension, and viscosi-ty. The oil does not spread on a snow or ice sur-face except when warm and under influence of the forces caused by dumping. The oil, when spilled on a snow surface, penetrates only a small distance. When spilled on the surface of lake ice, the oil shows no visible signs of penetration. Cleanup should be made before spring thaws as the oil does not spread and does not penetrate deeply into the surface during the winter. Thus, the cleanup can be more easily handled and controlled. (Woodard-USGS)

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Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

ary bibliographic entry see Field 05A. For prin W73-07419

OILY WASTE DISPOSAL BY SOIL CULTIVA-

TION PROCESS, Shell Oil Co., Deer Park, Tex. Houston Lab.

Shell Oil Co., Deer Park, 19x. Houston Lab.
C. B. Kincannon.
Copy available from GPO Sup Doc as
EPI.23/2:72-110, \$2.00; microfiche from NTIS as
PB-219 059, \$0.95. Environmental Protection
Agency, Technology Series Report EPA-R2-72110, December 1972. 115 p, 30 fig, 4 tab, 15 ref.
EPA Project 12050 EZG.

Descriptors: *Oil wastes, *Sludge treatment, *Soil Disposal fields, *Soil microbiology, *Sludge disposal, Disposal, Soils Oil industry; Oil, Water pollution sources, Industrial waste, Wastes, Baceria, Decomposing organic matter, Biodegrada

tion, Waste disposal, Microorganisms, Aerobic bacteria, Soil bacteria pseudomonas fertilization, Drainage effects, Fertilizers, Soil treatment nutrient requirements, Ammonium compounds, Nitrates, Phosphates, Potash, Ureas, Chromatography, Separation techniques, Solvent extraction fertilizer.

Identifiers: Arthrobacter, Corynebacterium, Flayobacterium, Nocardia, Infrared adsorption oil

Three oily materials were used in parallel experiments to demonstrate oily waste disposal by a soil cultivation process at prevailing climatic conditions. The 18-month experiments conducted with nine soil test plots at Deer Park, Texas, showed average oil decomposition rates of 0.5 lbs/ft3 of soil per month without fertilizers and about 1.0 lb/ft3/month when fertilizers and about 1.0 lb/ft3/month when fertilizers and about 1.0 major micorbial species active in the soil were members of the genus Arthrobacter, Corynebacterium, Flavobacterium, Nocardia, and Pseudomonas. Predominant species in each soil test plot are reported on a monthly basis. Differences in decomposition rate and microbial species due to hydrocarbon type as present in the three feedstocks, i.e., crude oil, bunker C fuel oil, and waxy raffinate oils, were minimal. Infrared and gas chromatography examinations of oil extracted from fertilized and unfertilized soils showed differences in organic acid contents and boiling ranges. Oil and fertilizer chemicals did not infiltrate vertically into the soil at the test location under prevailing conditions. Rainfall runoff water contained (1) up to 100 ppm extractable oils found to be naphthenic acids and (2) up to 150 mg/l ammonia as N when the nitrogen nutrients were excessive in the soil. Photographs show preparation of soil test plots, spreading of oil on the soil, and cultivation. Data are tabulated and shown graphically. (EPA)

REHABILITATION OF A BRINE-POLLUTED

AQUIFER, Arkansas Div. of Soil and Water Resources, Little Rock

L. S. Fryberger.
Copy available from GPO Sup Doc as EP1.23/2:72-014, \$1.25; microfiche from NTIS as PB-218 860, \$0.95. Environmental Protection Agency, Technology Series, Report EPA-R2-72-014, December 1972. 61 p, 16 fig, 4 tab, 7 ref. EPA Project 14020 DLN.

Descriptors: "Groundwater, "Water pollution, "Pollution abatement, "Brine disposal, Water pollution sources, Water pollution control, Water pollution effects, Path of pollutants, Aquifers, Saline water, Freshwater interfaces, "Arkansas hydrology, Water chemistry, Water conservation, Waste

water disposal.

Identifiers: *Aquifer rehabilitation, Red River,
Disposal wells, Disposal pits.

A detailed investigation was made of one (among several noted) incident where a fresh-water aquifer has been polluted by accepted disposal of oil-field brine through an 'evaporation' pit (an unlined earthen pit) and later a faulty disposal well. The present extent of the brine pollution is one square mile, however it will spread to affect a 4 1/2 square miles and will remain for over 250 years before being flushed naturally into the Red River. Detailed chemical analyses show changes in relative concentrations of constituents as the brine moves through the aquifer. Several rehabilitation moves through the aquifer. Several rehabilitation moves through the aquifer. Several rehabilitation methods are evaluated in detail, including controlled pumping to the Red River and deep-well disposal. None of the methods that are both technically feasible and permissible show a positive public benefit-cost ratio. Although real economic damage both present and future results from this brine pollution, rehabilitation is not now economically justified. Greater effort is needed to prevent such pollution, which not only affects groundwater resources but also affects water quality in interstate streams. (EPA abstract) W73-07431

PRESSURE BEHAVIOR IN SUBSURFACE DISPOSAL OF LIQUID INDUSTRIAL WASTES, Mississippi State Univ., State College. For primary bibliographic entry see Field 05E. W73-07451

FOCUS ON BLEACHING, For primary bibliographic entry see Field 05D. W73-07466

DISCUSSION OF: "TWO DIMENSIONAL SUR-FACE WARM JETS", Hydraulics Research Station, Wallingford (En-

gland). H. O. Anwar, and E. Hirst. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HYI, p 297-301, January 1972. 9 ref.

Descriptors: "Theoretical analysis, "Jets, "Effuents, "Heated water, Hydraulic engineering, Fluid mechanics, Mathematical studies, Heat transfer, Convection, Shear, Buoyancy, Turbulence, Air-water interfaces, Diffusion, Thermodynamics, Thermal pollution.

In one of two discussions of the article Two-Dimensional Surface Warm Jets, by Robert C. Y. Koh, it is pointed out that the assumption has been made that the flows in the two-dimensional surmade that the flows in the two-dimensional sur-face layer are self-similar for all x. The similarity condition was examined and the results compared with those obtained by Koh. The similarity as-sumption is not justified if the flow does not in-dicate that the condition at each section downstream from the outlet is similar. The second downstream from the outlet is similar. The second discussion describes two new prediction techniques and compares them with Koh's method. One method is an integral method solution developed by Motz and Benedict. This method has serious shortcomings, but has provided good correlations of laboratory experiments and field data. The second method was developed by Stolzenbach and Harleman. It has been shown careful or excursive methods of some combine. oy Stotzenbach and Harleman. It has been shown capable of accurate predictions. Some combination of the three methods may prove a valuable predictive tool. (See also W72-10828 and W73-07485) (Jerome-Vanderbilt)

DISCUSSION OF: 'TWO DIMENSIONAL SUR-

FACE WARM JETS', Tennessee Valley Authority, Norris. Engineering

Lao.
K. D. Stolzenbach, and D. R. F. Harleman.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 98, No HY4, p
713-716, April 1972. 2 fig, 1 ref.

Descriptors: "Heat transfer, "Jets, "Effluents, Hydraulic engineering, Fluid mechanics, Theoreti-cal analysis, Mathematical studies, Convection, Shear, Buoyancy, Turbulence, Air-water inter-faces, Diffusion, Thermodynamics, Thermal pol-

In a discussion of the article, Two Dimensional Surface Warm Jets, by Robert C. Y. Koh, the properties of three-dimensional surface discharges which limit the applicability of the two-dimensional theory to actual discharges are presented. An analytical and experimental study of a three-dimensional heated surface jet issuing from a rectangular channel was conducted which included the length of an establishment region near the outfall and lateral spreading of the discharge as a density current in addition to factors which were considered by Koh. Dimensionless parameters

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which are basic to the solution of the theoretical model are presented. A theoretical calculation which demonstrates the general structure of a three-dimensional heated surface discharge is presented, and, it is concluded that both lateral and vertical processes are important, so that a two-dimensional description of a jet will not suffice. Any treatment considering surface heat loss far from the jet region should also treat ambient diffusive processes. (See also W72-10828 and W73-07484) (Jerome-Vanderbilt) W73-07484. W73-07485

HEAT FLOW MEASUREMENTS IN BAFFIN BAY AND THE LABRADOR SEA, Dalhousie Univ., Halifax (Nova Scotia). Dept. of

Physics. G. D. Pye, and R. D. Hyndman. Journal of Geophysical Research, Vol 77, No 5, p 938-943, February 1972. 2 fig. 1 tab, 20 ref.

Descriptors: "Heat flow, "Bays, "Thermal stratifi-cation, Geophysics, Geology, Oceanography, Bathymetry, Deep water, Mapping, Arctic Ocean, Conduction, Convection, Thermal properties, Sediments, Bottom sediments, Sedimentation rates, Model studies, Canada, Thermal pollution. Identifiers: "Baffin Bay, "Labrador Sea.

Ten measurements of geothermal heat flux have been made in Baffin Bay and the Labrador Sea. been made in Baffin Bay and the Labrador Sea. The mean of five geographically separate values from Baffin Bay is 1.35 plus or minus 0.14 micro-callsqcm-sec, and the mean of three values from the Labrador Sea is 1.35 plus or minus 0.15 micro-callsqcm-sec. The heat flows in the center of the Baffin Bay basin are slightly higher than the heat flows toward the sides. The lack of a pronounced thermal anomaly suggests that there is little or no spreading in these areas at present. There is no detectable thermal anomaly associated with the zone of seismicity in northern Baffin Bay. The thermal gradients in northern Baffin Bay were non-linear; the nonlinearity indicates a recent bottom-water temperature change. The data require that a single the hominearity instructs a recurr other was temperature change. The data require that a single bolus of warm bottom water passed through the area 6 to 7 weeks before the first measurements and remained for 2 weeks. (Jerome-Vanderbilt)

THERMAL FRONTAL ZONES IN THE EAST-RERN MEDITERRANCEAN SEA,
Rhode Island Univ., Kingston. Graduate School of
Oceanography.
E. R. Levine, and W. B. White.
Journal of Geophysical Research, Vol 77, No 5, p
1081-1086, February 1972. 4 fig. 1 tab, 8 ref.

Descriptors: *Oceanography, *Thermocline, *Water temperature, Geophysics, Thermal properties, Density, Cossts, Ocean currents, Ocean circulation, Thermometers, Bathymetry, Mapping, Bathythermographs.

Identifiers: *Mediterranean Sea.

From August 7 to October 4, 1966, near-surface From August 7 to October 4, 1966, near-surface temperature measurements in the eastern Mediterranean Sea were taken on cruise 61 of the R. V. Chain. These measurements consisted of towing a constant-level, continuously recording temperature sensor behind the ship and were supplemented by bathythermograph lowerings taken every 2 hours. Visual inspection of these data shows that near-surface horizontal temperature changes along the cruise track were not continuous, but rather occurred in an approximate stepwise fashion at 20 locations, where the temperature gradient exceeded 1 C/10 km either at the surface or in the seasonal thermocline. The geoture gradient exceeded 1 (70 km either at the sur-face or in the seasonal thermocline. The geo-graphical distribution of the locations of these gradients suggests that the ship made 19 crossings of two long thermal frontal zones. One frontal zone was located in the Ionian basin and the other in the Levantine basin; both appear to have separated the warm water adjacent to the const

from the colder water in the interior of the basin. These two frontal zones may have been continuous and assoicated with the general counter-clockwise circulation around the eastern Mediterranean basin. (Jerome-Vanderbilt)

TEMPERATURE FINE STRUCTURE IN LAKE

ONTARIO, Toronto Univ ., (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 02H.
W73-07498

SPECTRA OF THERMALLY STRATIFIED TUR-BULENT FLOW WITH NO SHEAR, Sofia Univ., (Bulgaria). Dept. of Meteorology. For primary bibliographic entry see Field 02E. W73-07499

THE GEOTECHNICAL CHARACTERISTICS OF A SPOIL HEAP AT YORKSHIRE MAIN COLLIERY, Durham Univ. (England). Dept. of Geology. R. K. Taylor, and D. A. Spears. Quarterly Journal of Engineering Geology, Vol 5, No 3, p 243-264, 1972. 7 fig, 1 plate, 8 tab, 13 ref.

Descriptors: *Degradation (Slope), *Slope stabili-ty, *Weathering, *Coal mine wastes, *Spoil banks, Waste dumps, Erosion, Landslides, Mine wastes. Identifiers: *Yorkshire (England).

A spoil heap at Yorkshire Main Colliery was sam-pled to determine whether or not degradation is taking place within the body of the heap. There is evidence that the heap evolved in three phases and that the small variations in material properties are more readily attributable to these stages of development, rather than being a consequence of systematic degradation with the age of the spoil. Statistical treatment of consolidated-drained triax-Statistical treatment of consolidated-drained triaxial data and comparison with 'fabricated' samples (made up in the laboratory) of unweathered parental rock-types from underground imply that the shear strength of the tip samples is not changing with time. The zone of instability within which superficial movements can occur is 3 meters, of the same order as the depth of the erosional runoff channels. There is restricted water movement through the body of the tip. (Knapp-USGS) W73-07542

CHESAPEAKE RESEARCH CONSORTIUM INC. ANNUAL REPORT JUNE 1, 1971-MAY 31,

For primar W73-07543 ary bibliographic entry see Field 02L.

A USER'S MANUAL FOR THREE-DIME-NSIONAL HEATED SURFACE DISCHARGE

COMPUTATIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of
Civil Engineering.
K. D. Stolzenbach, E. E. Adams, and D. R. F.

Copy available from GPO Sup Doc as EPI.23/2.73-133, \$1.25; microfiche from NTIS as PB-219 243, \$0.95. Environmental Protection Agency, Technology Series, Report EPA-R2-73-133, January 1973. 97 p, 23 fig, 16 ref. EPA Project 16130 DJU.

Descriptors: Waste disposal, "Heated water, Tur-bulent buoyant layers, Jets, "Thermal pollution, Water temperature, "Thermocline, Dishcarge (Water), Model studies, "Porecasting, "Computer programs. Identifiers: *Waste heat disposal.

The temperature distribution induced in an am bient body of water by a surface discharge of heated condenser cooling water must be determined for evaluation of thermal effects upon the natural environment, for prevention of recirculation of the heated discharge into the cooling water intake, for improved design of laboratory scle models and for insuring that discharge configurations meet legal temperature regulations. This report presents a review of the theoretical background for a three-dimensionsal temperature prediction model, a detailed discussion of the computer program and a case study illustrating the procedure for optimizing the design of a surface discharge channel. Flow chart, program listing and a sample of the input and output data are given in the appendices. The model presented here includes modifications of the report by Keith D. Stolzenbach and Donald R. F. Harleman, published in February 1971 entitled, 'An Analytical and Experimental Investigation of Surface Discharges of Heated Water.' (See W72-09729) (EPA) (EPA) W73-07546

AN IMPROVED METHOD FOR DETERMINING ORGANICS BY ACTIVATED CARBON AD-SORPTION AND SOLVENT EXTRACTION .

PART I, National Environmental Research Center, Cincinnati, Ohio. For primary bibliographic entry see Field 05A. W73-07574

FACTORS INFLUENCING TRANSLOCATION AND TRANSFORMATION OF MERCURY IN RIVER SEDIMENT, Wisconsin Univ., Madison. Dept. of Entomology. F. Matsumura, Y. Gotoh, and G. M. Boush. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 5, p 267-272, November 1972. 1 fig, 1 tab, 9 ref.

Descriptors: *Mercury, *Sediments, *Hydrogen ion concentration, *Microorganisms, *Absorption, Path of pollutants, Water analysis, Separa-

tion, rath of pontiants, water analysis, Separa-tion techniques, Chromatography, Wisconsin, Radioactivity techniques. Identifiers: "Sample preparation, "Mobilization, "Thin layer chromatography, "Biotransformation, Alkylmercury, Mercury chloride, Chippewa River, Wisconsin River, Bioaccumulation.

Samples of sediment and water were collected from several locations in Wisconsin and subjected to several treatments to attempt to determine the factors affecting the mobilization of mercury. Samples were spiked with Hg-203 by adding HgC12 to a sample of sediment and water, shaking, and storing at 4 C for 30 days. The effects of pH were studied by adding HC1 or Na2CO3 to the samples. After incubation, the water and sediment were separated. Water was extracted with toluene and sediment with acetone. After evaporation of the acetone, the residue was partitioned between toluene and water. All toluene extracts were combined and designated as the organic mercury fraction. The remaining sediment was resuspended in distilled water and directly radio-assayed. The toluene extracts were examined for alkylmercury content by thin layer chromatography. Samples were also prepared using the same procedure under anaerobic conditions. In one sample in which profuse microorganism growth occurred, factors affecting the mobilization of mercury. under anserook condutions. In one sample in which profuse microorganism growth occurred, analyses showed that the available mercury was absorbed by the organisms, but only small amounts of radioactivity were convertible to alkyl or aryl forms and almost no methylation occurred. (Little-Battelle) W73-07578

A SIMPLIFIED METHOD OF PREDICTING DISSOLVED OXYGEN DISTRIBUTION IN PARTIALLY-STRATIFIED ESTUARIES, Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering. S. Ratsauk.

Water Research, Vol 6, p 1525-1532, 1972. 5 fig, 1

Descriptors: *Dissolved oxygen, *Estuaries, *Stratification, *Methodology, *Forecasting, Profiles, Equations, Flow rates, Salinity, Identifiers: Tyne Estuary (England), Salinity

stratification.

The pattern of salinity and dissolved oxygen stratification in a partially-stratified estuary was delineated from results obtained during a pollution study of the Tyne Estuary in North-east England. Salinity data showed that the estuary was normally partially-stratified but could become well-mixed at low freshwater flow. However, a two-layer flow system always existed, even under well-mixed conditions. Unlike salinity stratification, dissolved oxygen stratification existed at all freshwater flow rates due to the two-layer flow condition and the self-purification process. It is suggested that only the surface and bottom dissolved oxygen conditions are required for practical use in pollution control of partially-stratified estuaries. A simple method of determining the surface and bottom dissolved oxygen concentrations from the depth-averaged concentration was developed and found to give satisfactorily accurate results. The method was based on the finding that, in almost all cases, dissolved oxygen oxpensed as a function of the surface, Csf, and bottom, Ch, dissolved oxygen, Cav, can then be expressed as a function of the surface, Csf, and bottom, Ch, dissolved oxygen oncentrations: Csf plus Cb equals 2 Cav. The data for Cav are obtained from the one-dimensional model. Consequently, if either Csf or Cb is known, the other remaining unknown can be readily determined. (Holoman-Battelle) remaining unknown can be readily determined.
(Holoman-Battelle)

HEAVY METAL LEVELS OF OTTAWA AND RIDEAU RIVER SEDIMENTS, Department of the Environment, Ottawa (On-tario). Inland Waters Branch.

Environmental Science and Technology, Vol 7, No 2, p 135-137, February 1973. 3 fig, 2 tab, 14 ref.

Descriptors: "Heavy metals, "Fluvial sediments, "Chemical analysis, "Soil analysis, "Aquatic soils, Coarse sediments, Silts, Clays, Mercury, Lead, Zinc, Copper, Nickel, Cobalt, Iron, Manganese, Identifiers: Atomic absorption spectrophotometry, Ottawa River, Rideau River.

Surface sediment samples were collected with a Lane sediment sampler at 2-mile intervals along the Ottawa and Rideau Rivers near Ottawa, Canada, in 1971. Three samples were taken at each sampling station about 10 yards from each bank and in the center of the river. One gram of each air-dried sample was weighed, digested in an acid solution for 2 hr at 70-90 C and the acid extracts analyzed for Pb, Hg, Zn, Cu, Ni, Co, Fe, Mn, and Cr using atomic absorption spectrophotometry. The finer sediment samples generally contained more heavy metal than the coarser samples. Since there was such a pronounced difference in the average metal concentrations, the surface areas of the samples were measured and taken into consideration when deciding whether or not metal levels were unusually high. Some anomalously high heavy metal concentrations found in the sediments in certain locations appeared to be related to

ments in certain locations open anomalously ments in certain locations appeared to be related to pollution of the rivers by municipal and industrial waste water discharges and waste disposal prac-tices. (Holoman-Battelle)

IDENTIFICATION OIL SPILL IDENTIFICATION WITH MICROENCAPSULATED COMPOUNDS SUITABLE FOR ELECTRON CAPTURE, California Inst. of Tech., Pasadena. Div. of Chemistry and Chemical Engineering. For primary bibliographic entry see Field 05A. W73-07589 SPILL

SEPARATION OF ALDRIN FROM AROCLOR

1254,
Oregon State Univ., Corvallis. Dept. of Food
Science and Technology.
For primary bibliographic entry see Field 05A.
W73-07592

SOURCES OF NUTRIENTS IN CANADARAGO

SOURCES OF RUTHERING IN CONSTRUCTION OF REAL PROPERTY OF THE P

Descriptors: "Nutrients, "Water pollution sources, "Detergents, "Rain, Waste water (Pollution), "Surface runoff, Phosphorus, Chlorides, Magnesium, Nitrogen, Potassium, Water pollution effects, Lakes, "New York, Eutrophication, Agricultural runoff, Pollution abatement.

Identifiers: "Canadarago Lake.

A study of the nutrient balance of Canadarago Lake in east-central New York State revealed that approximately 52 percent of the phosphorus input came from land runoff, 46 percent from waste water, and 2 percent from rainfall. Detergents represented approximately 56 percent of the waste water phosphorus load. Approximately 23 percent of the total phosphorus, 72 percent came from waste water. Of total nitrogen, 91 percent was from land runoff. Waste water loadings of chlorides, magnesium, and potassium were minor. Phosphorus and nitrogen contributions were 4.8 and 10.3 g/day/cap, respectively. Control measures might reduce phosphorus load by two-thirds and improve the lake, perhaps even to the mesotrophic state, in 2 to 3 years. (Little-Battelle) W73-07593 A study of the nutrient balance of Canadarago

STRENGITE DISSOLUTION IN FLOODED SOILS AND SEDIMENTS,
Louisiana State Univ., Baton Rouge. Dept. of

Agronomy. B. G. Willia

Science, Vol 179, No 4073, p 564-565, February 9,

Descriptors: *Phosphorus, *Oxidation-redu potential, "Hydrogen ion concentration, "Sedi-ments, Reduction (Chemical), Phosphates, Radioactivity techniques, Soils, Path of pollutants. Identifiers: "Strengite, "Dissolution.

To investigate the conditions under which phosphorus is released from strengite in flooded soil and sediments, suspensions of a rice soil were incubated at oxidation-reduction potentials of 300, 100, -100, and -250 mv and at pH values of 5.0, 6.0, 7.0, and 8.0. The strengite (FePO4 + H2O) was synthesized with Fe-59. After incubation for 7-10 days, assumes of the suspensions were removed. synthesized with Fe-59. After incubation for 7-10 days, samples of the suspensions were removed without contact with the air, and iron and orthophosphate were extracted with ammonium acetate solution. Iron was analyzed by the alphaalpha prime-dipyridyl method and phosphate by the chlorostannous-reduced molybdophosphoric blue color method. Fe-59 was determined with a deep well gamma counter. The results show that strengite partially dissolves under reducing conditions such as those that exist in flooded soils deprived of oxygen. A close relationship existed between the amount of strengite dissolved and between the amount of strengite dissolved and both the redox potential and the pH of the soil suspension. There is a marked interaction between acidity and redox potential, with strengite reduction and solubilization being more pronounced under conditions of low pH combined with low redox potential. (Little-Battelle) PROBLEMS IN THE ANALYSIS OF PHOSPHORUS COMPOUNDS, Southampton Univ. (England). Dept. of Oceanog-For primary bibliographic entry see Field 05A. W73-07604

ENVIRONMENTAL IMPACT OF DETERGENT BUILDERS IN CALIFORNIA WATERS, California Univ., Berkeley. Sanitary Engineering Research Lab. bibliographic entry see Field 05C.

SOIL AND FERTILIZER PHOSPHORUS IN THE

IRISH ECOSYSTEM,
Foras Taluntais, Wexford (Ireland).
P. K. Hanley, and M. D. Murphy.
Water Research, Vol 7, Nos 1/2, p 197-210, January/February 1973. 6 fig, 8 tab, 61 ref.

Descriptors: "Phosphorus, "Fertilizers, "Eutrophication, "Water pollution sources, "Agricultural runoff, "Farm wastes, Erosion, Rain, Phosphates, Nutrients, Water pollution control, Sediments, Precipitation (Atmospheric), "Farm wastes, Feed lots. Identifiers: "Ireland.

An attempt was made to define the sources of phosphorus in water eutrophication in Ireland, from an agricultural viewpoint. The place of soils, fertilizers, animal wastes, precipitation, crops, run-off and erosion in the overall phosphorus budget was outlined, using local data and extrapolation from findings elsewhere. It would appear that fertilizers at present play a minor part in eutrophication. The role of sediments is largely unknown because little data are available. Animal wastes, if not handled correctly, could pose unknown because little data are available. Anumal wastes, if not handled correctly, could pose problems, particularly if future plans for increasing livestock numbers are carried through. The solutions to water eutrophication involve other interests, apart from agriculture. The island aspect of the ecosystem should be helpful in defining and collections of the problems of autochicates of the constant of the problems. solving the problems of eutrophication. (Little-Battelle) W73-07607

THE ACCELERATION OF HYDROGEOCHEMICAL CYCLING THE

PHOSPHORUS, Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).

Water Research, Vol 7, Nos 1/2, p 131-144, January/February 1973. 9 fig, 2 tab, 27 ref.

Descriptors: "Water pollution sources,
"Phosphorus, "Cycling nutrients, Fertilizers, Oxygen demand, Limiting factors, Sediments, Water
pollution effects, Phosphates, Nutrients, Water
pollution control, Animal wastes, Farm wastes,
Detergents, Municipal wastes, Lakes, Agricultural
runoff, Oceans, Rivers.
Identifiers: Fate of pollutants, Mobilization,
Phosphorites, Phosphorus cycle.

By mining phosphorus in progressively increasing quantities, man disturbs the ecological balance and creates undesirable conditions in inland waters, estuaries and coastal marine waters. The civilizatory increase in phosphorus supply to the oceans although of little consequence to the oxygen reserves of the deep sea, augments markedly the marine environments with intermittent or permanent oxygen deficient conditions. Because most aquatic food resources are produced in estuaries and constal areas, the deterioration in water quality of these regions decreases the potential harvest of marine animal protein. Present agricultural practice of excessively fertilizing land needs to be reexamined; present agricultural technology must

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not without modification be exported to tropical areas. Present drainage systems for sewage, indus-trial wastes and storm water runoff accelerate the transport of nutrients and other pollutants to the rivers and the sea; waste plants are remarkably in-efficient in mitigating this civilizatory flux. (Little-Battelle) W73-07609

SIGNIFICANCE OF PHOSPHORUS IN LAKES AND COASTAL WATER SEDIMENTS AND

BENTHOS, Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).

Water Research, Vol 7, Nos 1/2, p 129, Janua-ry/February 1973.

Descriptors: *Phosphorus, *Sediments, *Lakes, *Turnovers, *Adsorption, Estuaries, Phosphates, Nutrients, Seasonal. Identifiers: Removal, Mobilization, Fate of pollu-

The dynamics of availability of sedin phosphorus to the overlying water depends on P concentration of interstitial water which in turn depends on the redox intensity and the affinity of the solid sediment phases for P. In lakes and coastal waters substantial fractions of P become creases waters assumed in actions of Poeconic irretrievably deposited into the sediments, but in lakes the seasonal sequence of P release to the water from the sediments tends to facilitate algal blooms in shallow waters. With increasing depth blooms in shallow waters. With increasing depth of the lake the net removal of P from the water by the sediments becomes preponderant and the quantity of P released from the sediments to the epiliminon becomes small relative to other fluxes. There are essentially the following ways for P to be deposited: (1) adsorption of P on clays; (2) burying the detrital P; (3) chemical precipitation of apatite; and (4) diagenetic replacement of calcite (e.g. skeletal carbonate) by substitution of carbonate by phosphate. Accumulation of P, regenerated from detritus as it occurs most extensively in shallow waters and under conditions of sively in shallow waters and under conditions of counter-current systems (estuaries), does not in itself lead to an increase in the relative apa ration because the regeneration of one P atom is accompanied by an increase in acidity caused by the formation of ca. 106 CO2 molecules. In order to exceed the critical ion product, the excess of CO2 must be lost or neutralized. Such conditions are encountered in areas of upwelling, where ex-cess CO2 is lost to the atmosphere and under reducing conditions where denitrification and SO4 reducing conditions where denitrification and SO4 (2-)-reduction consume hydrogen ions. (Little-Bat-W73-07610

PHOSPHATES IN SEWAGE AND SEWAGE

TREATMENT, For primary bibliographic entry see Field 05A. W73-07611

THE SIGNIFICANCE OF MAN-MADE SOURCES OF PHOSPHORUS: DETERGENTS AND SEWAGE

AND SEWACE, Upper Tame Main Drainage Authority, Bir-mingham (England). D. G. Devey, and N. Harkness. Water Research, Vol 7, Nos 1/2, p 35-54, Janua-ry/February 1973. 3 fig, 11 tab, 8 ref.

Descriptors: *Phosphates, *Detergents, *Sewage, *Industrial wastes, *Domestic wastes, Water pollution sources, Phosphorus, Nutrients. Identifiers: England.

The aims are to establish the significance of detergents and sewage as sources of phosphorus to the aquatic environment. Information has been obtained as to the composition of washing powders

and liquids containing phosphates and the reasons for the use of phosphates. Consumption data show that the trends for detergent use are still very much upward, with a consequent increasing load of phosphates into the aquatic environment based on present formulation. In the United Kingdom it may be that the consumption of detergents will not level off for 10 yr or more if American trends are followed. The section on sewage gives details of ievel off for 10 yr or more it American trends are followed. The section on sewage gives details of the varying levels of phosphates that are found at differing works and the various sources from which these arose. Variations over the day of which these arose. Variations over the day of phosphorus and detergent in sewage show the expected usage pattern for households. Some data have been obtained on the phosphorus content of industrial effluents, but at present these do not appear to be a major source overall, although particular processes, e.g. anodizing, may waste appreciable concentrations of phosphates. Discussion of the total phosphorus contribution to the aquatic environment per annum shows the tremendous amount of nutrient phosphorus which is discharged to the river system from sewage, even when detergent phosphate is not taken into consideration. At present there is little or no problem due to phosphates in the aquatic environment in the United Kingdom but this is not to say it will not arise. (Little-Battelle)

ADSORPTION OF PARATHION IN A MUL-TICOMPONENT SOLUTION, Wisconsin Univ., Madison. Water Chemistry Pro-

For primary bibliographic entry see Field 05A. W73-07613

UNDERGROUND POLLUTION ANALYSIS AND

Cincinnati Univ., Ohio. Div. of Water Resources. H. C. Preul.

Water Research, Vol 6, No 10, p 1141-1154, October 1972. 7 fig, 4 tab, 9 ref.

Descriptors: *Underground, *Pollution abatement, *Water pollution, *Groundwater movement, *Pollutants, *Plow rates, *Mathematical studies, Dissolved solids, Chlorinated hydrocarsudnes, Dissolved solids, Chlorinated hydrocar-bon pesticides, Coliforms, Heavy metals, Salts, Alkali metals, Path of pollutants, Nitrates, Chlorides, Sulfates, Phosphorus, Potassium, Iron, Manganese, Sodium, Mercury, Cadmium, Lead, Chromium, Nickel, Copper, Zinc, Hardness, Cal-cium carbonate, Phenols, Color, Odor, Oil, Radioactive wastes.

Identifiers: Enteric viruses, Fecal streptococci, Cvanides, Arsenic, Barium.

Criteria are presented for the evaluation of levels of underground pollution along with practical methods for the analysis of the rate of travel of underground pollution. Pollutants which may be of concern in groundwater have been categorized into 'reacting' and 'non-reacting' types for purposes of analysis in underground movement. Limits for the specific forms of these types have also been proposed. These limits are in general acord with the established requirements for drinking water such as those of the World Health Organization. For a simulation of the rate of travel of a pollutant in groundwater, basic pollutant transa pollutant in groundwater, basic polluta a politicant in groundwater, oasic politicant trans-port equations have been given. In the past, these equations have been largely of academic interest. However, these equations have now been solved using numerical and computer techniques. These techniques may be applied to practical problems such as the prediction of movement of a pollutant of a certain concentration within the influence or a certain concentration within the intruence cone of a pumping water well. In general, the methods may be used to analyze existing pollution so that rehabilitative measures may be applied or they may be used to analyze projected conditions of pollution travel where prevention is of concern. (Holoman-Battelle)

ENVIRONMENTAL CONSIDERATIONS FOR ESTUARINE BENTHAL SYSTEMS, Oregon State Univ., Corvallis. Dept. of Civil Engineering. For primary bibliographic entry see Field 05C, W73-07615

SIGNIFICANCE OF MAN-MADE SOURCES OF PHOSPHORUS: FERTILIZERS AND FARMING, Rothamsted Experimental Station, Harpenden

Rothamsted Experimental Station, Harpenden (England). G. W. Cooke, and R. J. B. Williams. Water Research, Vol 7, Nos 1/2, p 19-33, January/February 1973. 9 tab, 26 ref.

Descriptors: "Phosphates, Water pollution sources, "Agricultural runoff, Fertilizers, Livestock, Erosion, Leaching, Animal wastes (Widdlife), Path of pollutants, Nutrients, Water pollution control, Runoff, "Farm wastes, Cattle, Hogs, Sheep, "Phosphorus, "Poultry. Identifiers: England.

There are three ways which phosphorus from agricultural areas can enter natural water supplies: in drainage water; in eroded soil; or from animal excreta. Study of these sources showed that in most cases runoff from agricultural lands contained less P than the receiving waters. However, where erosion occurs, P levels in water may be increased since fertilizers tend to fix themselves to topsoil which is lost first. The P in muds is solubilized in anaeophic reducing conditions and become creased since fertilizers tend to fix themselves to topsoil which is lost first. The P in muds is solubilized in anaerobic reducing conditions and becomes available to rooted plants and microorganisms. Most animal excreta is reapplied to land as fertilizer and may occasionally pollute streams if it is improperly applied or if heavy rains occur. In addition, new methods of handling excreta as slurries increase the potential of pollution by over application or leakage of storage tanks. One source of phosphorus in natural waters which is often not considered is wild birds. These may add significantly to P levels in water. At present, it appears that agricultural sources add little P to natural waters. However, steps must be taken to assure that the three potential sources are adequately controlled. (Little-Battelle) W73-07618

NATURAL PHOSPHATE SOURCES IN RELA-TION TO PHOSPHATE BUDGETS: A CON-TRIBUTION TO THE UNDERSTANDING OF EUTROPHICATION, Hydrobiologisch Instituut, Nieuwersluis (Nether-lands).

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For primary bibliographic entry see Field 05C. W73-07619

NUCLEAR MAGNETIC RESONANCE STUDIES OF THE SOLUTION CHEMISTRY OF METAL COMPLEXES, DETERMINATION OF FORMA-TION CONSTANTS OF METHYLMERCURY COMPLEXES OF SELECTED CARBOXYLIC ACTISS

ACIDS, Alberta Univ., Edmonton. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07625

GAS CHROMATOGRAPHIC STUDIES OF SORPTIVE INTERACTIONS OF NORMAL AND HALOGENATED HYDROCARBONS WITH WATER-MODIFIED SOIL, SILICA, AND

WATER-MODIFIED SOIL, SILICA, AND CHROMOSORB W, California Univ., Riverside. Dept. of Chemistry. J. P. Okamura, and D. T. Sawyer. Analytical Chemistry, Vol 45, No 1, p 80-84, January 1973. 5 fig, 4 tab, 21 ref.

Descriptors: *Soils, Model studies, Gas chromatography, Adsorption, Absorption, Path of pollutants, Silica, Fumigants, Soil sterilants, Pesticide kinetics.

Identifiers: *Transport, *Persistence,

Identifiers: *Transport, *Persistence,
*Halogenated methanes, Retention, Chromosorb

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

To study the persistence and movement of pesti-To study the persistence and movement of pesti-cides in soils, gas chromatography with wetted soil columns has been used to determine the retention mechanisms of pesticides and halogenated methanes (used as soil fumigants). The principal modes of interaction with the wetted soils include adsorption on the water surface and absorption by the water layer. The equilibrium constants for adsorption and absorption in model systems, water on Chromosorb W and on porous silica beads, have been evaluated and interpreted in terms of molecular parameters. These models illustrate an approach for ascertaining the state of water on soil and for the prediction of retention volumes on this complex material. Data from the model systems allow calculation of both the amount of water on the soil surface and the surface area of the aqueous layer. (Little-Battelle) W73-07627 orption on the water surface and absorption by

MULTICOMPONENT PATTERN RECOGNI-TION AND DIFFERENTIATION METHO ANALYSIS FOR OIL IN NATURAL WATERS, Rocketdyne, Canoga Park, Calif. For primary bibliographic entry see Field 05A. METHOD.

SALINIZATION OF GROUNDWATER IN ARID

ZONES, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 04B. W73-07642

A STUDY ON DENSITY AND SPECIES OF AZOTOBACTER IN SOIL, WATER, AND LEAF SAMPLES FROM SOUTHERN IRAQ,

SAMPLES FROM SUUTHERN IRAQ, Institute for Applied Research on Natural Resources, Baghdad (Iraq), Y.Z. Ishac, and A. N. Yousef. Technical Bulletin 42, November 1972, 18 p. 1 fig,

Descriptors: "Azotobacter, "Soil investigations, "Water chemistry, "Nitrogen fixing bacteria, "Soil texture, "Soil microorganisms, Biochemistry, Arid lands, Nitrogen fixation, Sampling, Land use, Saline soils, Salinity, Saturated soils, Irrigation canals, Leaves, Water properties, Water quality, Soil tests, Soil microbiology, Clostridium. Identifiers: "Iraq.

Surveys of Azotobacter populations in Iraqi soils were initiated in order to determine distribution of Azotobacter in different types of soil and water, and on leaves of plants from areas along the Tigris River and Shat-al-Arab in southern Iraq. A total of 76 soil samples from different depths, representing different soil textures, land use conditions, and different soil textures, land use conditions, and salinity levels were collected. Forty-eight water samples from artesian wells, rivers, irrigation canals, and stagnant pools, and 53 samples of leaves from different plant species were also examined. All soil samples contained Azotobacter (generally more than 100 cells/g soil). Density of Azotobacter was apparently affected by soil texture (low in sand), soil depth (decrease with depth), type of crop and soil salinity. A. chrococcum and A. vinelandii were the only species encountered. Azotobacter species were present in all cum and A. vinelandii were the only species en-countered. Azotobacter species were present in all water samples, with rivers yielding up to 1600 cells/ml. Irrigation canals, with apparently less suspended matter, contained 800 to 5400 cells/ml and artesian water contained 1500 cells/ml. Species found in all water samples were A. chroococ-cum and A. vinelandii, while A. agile was only encountered in rivers and irrigation canals.

Azotobacter was found in 51 or 53 leaf samples, all yielding A. chroococcum. Species of the anaerobic Clostridium were found in eight samples. (Black-W73-07644

A THEORY ON THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: III. EXACT SOLUTION FOR FIRST-ORDER KINETIC SORBTION,

Oregon State Univ., Corvallis. For primary bibliographic entry see Field 02G. W73-07668

AXISYMMETRIC SHALLOW SUBMERGED TURBULENT JETS, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B. W73-07669

PORT IN RIVERS, Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences. R. J. Gibbs.

Science, Vol 180, No 4081, p 71-73, April 6, 1973. 1 fig. 1 tab. 7 ref.

Descriptors: *Trace elements, *Geochemistry, *River flow, Water chemistry, Metals, Solubility, Ion transport, Sediments, Crystallization, Organic

Identifiers: *Amazon River, *Yukon River, Trace

Evaluations are presented of the amounts of Fe, Ni, Cu, Cr, Co, and Mn transported by the Amazon and Yukon Rivers. The trace metals were Amazon and Yukon Rivers. The trace metals were analytically partitioned among the transport phases: in solution, ion exchange, organic materials, metallic coatings, and crystalline solids. All the samples of water and suspended sediments were taken from the rivers at 60% of main channel depths and upstream from any influence of saline water. The trace metals distribution for both rivers is similarly proportioned with copper and chromium transported mainly in the crystalline solids, manganese in coatings, and iron, nickel, and cobalt distributed equally between precipitated metallic coatings and crystalline solids. (Lang-USGS) USGS)

BACTERIAL MOVEMENT THROUGH FRAC-

TURED BEDROCK,
Colorado State Univ., Ft Collins. Dept. of
Microbiology.
M. J. Allen, and S. M. Morrison.

Ground Water, Vol 11, No 2, p 6-10, March-April 1973. 2 fig, 2 tab, 5 ref. OWRR 14-01-001-1882.

Descriptors: "Path of pollutants, "Groundwater movement, "Bacteria, "Fractures (Geologic), Tracers, Tracking techniques, Water pollution, Coliforms, Joints (Geologic), Aquifer charac-teristics, Hydrogeology, Colorado.

The movement of bacteria-laden waters percolating through fractured crystalline bedrock in mountainous terrain was examined to determine whether effluent originating from domestic waste disposal systems could contaminate shallow groundwater supplies. Inoculated waters were injected into holes and/or wells at two geologically different test sites (granitic, metamorphic) to evaluate the extent of microbial filtration in or along bedrock fractures. The direction and rate of movement of contaminated groundwaters were controlled largely by the anisotropic nature of the geologic stratum, particularly by the orientation of major bedrock fracture sets. Inoculated waters najor bedrock fracture sets. Inoculated waters major bedrock fracture sets. Inoculated waters were readily transported into a downslope well. At one test site, a tracer bacterium traversed a horizontal distance or 94 feet in 24 to 30 hours. The organism was present for at least five days after inoculation of the upslope well. In the zone of acruiton, bacteria-laden effluent percolates in or along fractures with inadequate filtration. In metamorphic rock, bacteria decreased slightly during percolation through bedrock fractures, and total bacterial densities were generally unchanged. Moderate percolation rates and minimum distances between water wells and leachfield type waste disposal units are inadequate to pro potable groundwater supplies from contamina in mountainous terrain. (Knapp-USGS)

WHERE HAVE ALL THE TOXIC CHEMICALS

GONE., Illinois State Water Survey, Urbana.

W. H. Walker. Ground Water, Vol 11, No 2, p 11020, March-April 1973. 2 fig, 1 tab, 7 ref.

Descriptors: "Water pollution sources, "Water pollution effects, "Path of pollutants, "Poisons, "Public health, Heavy metals, Pesticides, Water wells, Waste dumps, Waste disposal wells. Identifiers: Groundwater pollution.

Many municipal, industrial, domestic and farm water supplies are derived from wells tapping shallow aquifers that have a high contamination potential from surface waste sources. Practically none of them are routinely checked for more serious contaminants such as viruses, weed killers, pesticides, trace metals, and toxic chemical compounds commonly used and eventually discarded in garbage dumps, waste-burial grounds, or disposal wells. Because of this, the possibility of serious groundwater contamination often is not discovered until a high degree of contamination is Many municipal, industrial, domestic and farm groundwater contamination often is not discovered until a high degree of contamination is present. Groundwater contamination from nitrate, arsenic, chromate, cadmium, chlorinated hydrocarbons, and a large number of other toxic chemicals is increasing. A serious threat to public health may be imminent unless all surficial and understanted diseased serious chemicals and understanted diseased serious contaminations. derground disposal sites of toxic chemicals are located, the extent and magnitude of groundwater contamination from each site evaluated, and corrective measures applied where necessary. (Knapp-USGS) W73-07676

SALT WATER INTRUSION IN THE SUMMER-

SIDE AREA, P.E.I., Ground Water Technical Services, Inc., Quebec. For primary bibliographic entry see Field 02L. W73-07677

PROBLEMS IN THE STUDY AND UTILIZA-TION OF WATER RESOURCES (PROBLEMY IZUCHENIYA I ISPOL'ZOVANIYA VODNYKH

RESURSOV).
For primary bibliographic entry see Field 04A.
W73-07680

OBSERVATION OF TURBULENCE IN THE BOTTOM LAYER OF THE SEA, For primary bibliographic entry see Field 08B. W73-07687

EXPERIMENTAL INVESTIGATION OF TURBULENT DIFFUSION IN THE SEA BY THE FLUORESCENT TRACER METHOD, For primary bibliographic entry see Field 08B. W73-07688

CONFERENCE: POLLUTION OF THE IN-CONFERENCE: POLLUTION OF THE INTERSTATE WATERS OF THE POTOMAC RIVER-WASHINGTON METROPOLITAN AREA, STATES OF MARYLAND AND VIR-GINIA, AND THE DISTRICT OF COLUMBIA. Federal Water Quality Administration, Washington, D.C. For primar W73-07696 rimary bibliographic entry see Field 05G.

Group 5B-Sources of Pollution

CONFERENCE: POLLUTION OF THE IN-TERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN,-NEW YORK-V-

eral Water Quality Administration, Washington, D.C.

For primary bibliographic entry see Field 05G. W73-07697

POLLUTION OF A MARINA AREA BY WATERCRAFT USE, Michigan State Univ., East Lansing. Dept. of Microbiology.

Microbiology.
W. N. Mack, and F. M. D'Itri.
Journal Water Pollution Control Federation, Vol.
45, No. 1, p 97-104, January, 1973. 2 fig, 3 tab, 10
ref. OWRR A-038-MICH (2), 14-31-0001-3222.

Descriptors: *Coliforms, *Marinas, *Water quali-ty standards, *Water pollution sources, Great Lakes, Michigan, Boats.

Samples of water from a marina used by water-craft were tested for the numbers of coliform or-ganisms. The tests indicated a slight increase in craft were tested for the numbers of coutorm organisms. The tests indicated a slight increase in coliform organisms in the slips most frequently used by the yachts. However, outside sources of contamination probably added to the total number of organisms in the area. Although the increase in the number of organisms was related to the number of yachts in the marina, the concentration was far below the standard of total body contact established by the Water Quality Standards Committee for Michigan Intrastate Waters. Finally, selected chemical parameters show no indication of human pollution because chemical analyses of water samples taken at the marina were all within normal limits. Bacteriological coliform organism analyses were proven to be a much more sensitive indication of human pollution. Other factors contributing to the presence of the coliform organisms, such as township septic tank discharges and fecal deposits from sea gulls in this largely unpopulated area, were investigated and considered relatively unimportant.

POTENTIAL OF ERODING SOILS FOR THE PHOSPHORUS ENRICHMENT OF STREAMS, Wisconsin Univ., Madison. Dept. of Soil Science.

M. Sc. Thesis, 1972. 138 p, 13 fig, 13 tab, 7 ref. OWRR A-038-WIS (2), 14-31-0001-3250 and 14-31-

Descriptors: *Phosphorus, Water pollution sources, *Fertilizers, Surface runoff, *Urban runoff, *Agricultural runoff, Streams, *Soil chemical properties, *Soil erosion, *Wisconsin. Identifiers: *Madison (Wis).

Acid-washed glass sorbed appreciable amounts of inorganic phosphate (P) from distilled water systems and significant amounts (up to 20%) from lake waters within one to six hours of contact. Pretreatment of polycarbonate with P eliminated sorption of inorganic P from distilled water and lake water and gave mean recovery values which had a low standard deviation. Lake waters should be filtered within six hours of collection. 'Phosphated' polycarbonate is recommended and the acid washed glassware should be avoided for storage of P solutions. Eroding soil horizons sorbed a varying proportion of added inorganic phosphate (P). The appreciable release of P from the Al horizon is attributed to the presence of a P fertilizer-soil reaction product. Data obtained from silulated stream systems employing conditions silulated stream systems employing conditions realistic in terms of the stream environment inreassuc in terms of the stream environment in-dicated appreciable differences in P sorption rela-tionships for individual horizons. Initial P concen-trations were shown to be more important than the solution: soil ratio in determining the extent of up-take and release of P. Nomograms were con-structed to illustrate the relationship between ini-

tial inorganic P concentration, equilibrium inor-ganic P concentration, and varying mixtures of soil horizons in systems realistic in terms of a stream nonzous in systems reasiste in terms of a stream environment. In this way, predictive ability is maximized. The validity of the adopted method is discussed with reference to conditions existing in stream environments. (Harris-Wisconsin) W73-07725

DEVELOPMENT OF METHOD FOR NTA ANALYSIS IN RAW WATER, National Bureau of Standards, Washington, D.C. For primary bibliographic entry see Field 03A.

LOS ALAMOS LAND AREAS ENVIRONMEN-TAL RADIATION SURVEY 1972, Los Alamos Scientific Lab., N. Mex. L. J. Johnson.

Available from NTIS, Springfield, Va., as LA-5097-MS. \$3 per copy, \$0.95 microfiche. Report No. LA-5097-MS, Nov. 1972. 27 p, 9 fig, 9 tab, 9

Descriptors: *Monitoring, *Radioactivity, Control, *Regulation, *Assay, *Survey, *Soil contamination, Water pollution, Vegetation, Population, Public health, Administrative agencies.

The details of an environmental radiological evaluation on about 5,500 acres in eight parcels of land owned by the United States Atomic Energy Commission in Los Alamos County, New Mexico, are presented. The environmental assessment of these real properties included a careful search of the administrative records of the Los Alamos Scientific. I abovatory to determine the extent the Scientific Laboratory to determine the extent the Scientific Laboratory to determine the extent the land might have been used or involved in the Laboratory's activities, extensive measurements of the radiation levels in the field, and radiochemical analysis of numerous soil and vegetation samples. A new portable radiation measurement instrument, designated as the Los Alamos Field Pulse Height Analyzer, was developed and used for this study. This analyzer proved to be valuable in documenting the low levels of radioactivity encountered. The results showed that all measured values were comparable to reported worldwide values were comparable to reported worldwide levels, and that no radiation or radioactive contamination observations were encountered that are of radiological health or environmental concern. The study therefore supports the conclusions that no abnormal environmental hazard as a result of past Laboratory activities, exists on the surveyed parcels of land. (Houser-ORNL)
W73-07756

DISTRIBUTION AND CYCLING OF RADIOAC-TIVE ISOTOPES RELEASED INTO THE SAVANNAH RIVER SWAMP FOREST: EN-VIRONMENTAL IMPLICATIONS, PROGRESS REPORT, NOV 1, 1971-AUG 1, 1972. Savannah River Ecology Lab., Aiken, S. C.

Available from NTIS, Springfield, Va., as SRO-708-1. \$3 per copy, \$0.95 microfiche. Report No SRO-708-1, 1972. 44 p, 5 fig, 16 tab, 30 ref.

Descriptors: "Nuclear power plants, "Effluent,
"Radioactivity, "Radioisotopes, "Rivers,
"Swamps, "Forests, Ecology, Animal ecology,
Plant ecology, Ecological distribution,
Ecosystems, Ecotypes, Radioecology, Environment, Environmental effects, Radioactivity effects, Food chains, Cesium, Public health.
Identifiers: "Savannah River.

Reports progress of a study on the environmental Reports progress of a study on the environmental implications of radioactivity released to a Savannah River Swamp forest. The specific objectives were to - (1) Completely review the literature pertinent to the proposed studies and study areas. (2) Define and mark off the limits of the study area and sampling areas within the overall plot. (3)

Compile a list of the most abundant or dominant species in the area and determine the degree to which the various species differ in the concentrations of the radioactive isotopes: Ca137, Co60. which the various species differ in the concentra-tions of the radioactive isotopes: Cs137, Co60, Zn56. (4) Identify the potential problem species that, because of their migratory habits and value as human food, carry isotopes off the Savannah River Plant site. (5) Initiate food chain studies in-volving the dominant and problem species. (6) Develop a model of the swamp forest to serve as a guide for the design of future studies and the identification of important components of the systems and transfer coefficients between these compartments of the model. (Houser-ORNL)

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RADIATION DATA, SECTION II. WATER. Environmental Protection Agency, Washington, D.C. Office of Radiation Programs.

Available from Supt. of Documents, U.S. Gov. Printing Office, Washington, D.C., \$0.50 per copy. Radiation Data and Reports, Vol 13, No 12, p 658-695, Dec 1972. 2 fig. 3 tab, 9 ref.

Descriptors: "Radioactivity, "Survey, "Measurement, "Assay, "Monitoring, "Environment, "Data collections, Administrative agencies, Federal Government, State government, Regulation, Air pollution, Water polllution, Soil contamination, Radioisotopes, Nuclear powerplant, Effluents, Fallout, Food chains, Public health.

Data are provided by Federal, State, and foreign overnmental agencies and other cooperating or-anizations. Data reported are accumulated from ganizations. Data reported are accumulated from surveillance programs concerning radionuclide concentrations of water. Also given are environmental levels of radioactivity at some Atomic Energy Commission installations. Some of the more important radioisotopes are strontium, cesium, iodine, barium, cobalt, xenon, and krypton. Data on gross radioactivity in surface waters of the United States are presented for April 1972. Also listed are data on water surveillance programs, January - March 1972, conducted by EPA National Environmental Research Center, Las Vegas, Nevada. (Houser-ORNL.)

ENVIRONMENTAL RADIOACTIVITY IN THE FAROES IN 1971,
Danish Atomic Energy Commission, Risoe
(Denmark). Health Physics Dept.

For primary bibliographic entry see Field 05A. W73-07761

ISOTOPE HYDROLOGY IN LATIN AMERICA, International Atomic Energy Agency, Paris (France). Div. of Research and Labs. International Atomic Energy Agency Bulletin, Paris, France, Vol 14, No 3, p 17-20, 1972.

Descriptors: "Radioisotopes, "Tracers, "Hydrology, "Groundwater, "Movement, "Distribution patterns, Streamflow, Surface waters, Tritium, Carbon, Sediments, Sediment transport. Identifiers: "Latin America.

A wide variety of problems in hydrology have proved susceptible to the use of nuclear techniques. Conclusions may be drawn from the techniques. Conclusions may be drawn from the relative abundances of certain environmental isotopes, such as heavy stable isotopes of hydrogen and oxygen in water molecules, tritium, carbon-14 and silicon-32, in atmospheric, surface or ground water; origin and rate of flow, for example, may be deduced. Artificial radioisotopes may be used similarly as a logical extension to well-known tracer techniques using dyes and salts. Inherent in the use of such radiotracers are the advantages of very high detection sensititivity (and thus very low required concentrations and the elimination of density effects), and a choice of a variety of nuclides alien to the geohydrological system (and hence unique identification and low background). Use of radioisotope techniques in Latin America is described. (Houser-ORNL)

A SELECTED ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS. Division of Peaceful Nuclear Explosives (AEC), Washington, D.C.

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Available from NTIS, Springfield, Va., as TID-3522 (9th Rev). \$6 per copy; 95 cents microfiche. Report No TID-3522 (9th Rev.), Sept. 1971. 366 p, 1594 ref, 4 indexes.

Descriptors: *Bibliographies, *Nuclear explosions, *Craters, *Excavation, Fallout, Nuclear energy, Nuclear engineering, Nuclear physics, Nuclear wastes, Underground, Seismology, Water pollution, Harbors, Canals, Beneficial use, Costbenefit analysis, Administrative agencies. Identifiers: *Plowshare Program, Atomic Energy

The Plowshare Program was formally established by the United States Atomic Energy Commission in 1957. This program, to study the feasibility of using nuclear explosions for peaceful purposes, has many potential applications in such areas as excavation of harbors, canals, and mountain passes, production of transplutonium isotopes, neutron physics research, gas and oil recovery and storage, waste disposal, mining, and water management. Laboratory and field experiments are currently under way to develop basic technology and to evaluate proposed applications. This bibliography contains 1594 annotated references to reports and published literature on the USAEC's Plowshare Program. The references are arranged by subject category. Report Number and Availability, Film and Tape, Author, and Experiment Indexes are included. (See also W73-07764) (Houser-ORNL)

A SELECTED, ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS. Technical Information Center (AEC), Oak Ridge,

Available from NTIS, Springfield, Va., as TID-3522 (Rev. 9 Suppl. 1), 33 paper copy, 95 cents microfiche. Report No. TID-3522 (Rev. 9, Suppl. 1), June 1972. 52 p, 250 ref, 4 indexes.

Descriptors: *Bibliographies, *Nuclear explosions, *Construction, *Creates, *Excavation, Fallout, Nuclear energy, Nuclear posineering, Nuclear physics, Nuclear wastes, Underground, Seismology, Harbors, Canals, Water pollution, Beneficial use, Cost-benefit analysis. Identifiers: *Plowshare program.

The Plowshare Program was formally established by the United States Atomic Energy Commission in 1971. This program, to study the feasibility of using nuclear explosions for penceful purposes, has many potential applications in such areas as excavation of harbors, canals, and mountain passes, production of transplutonium isotopes, neutron physics research, gas and oil recovery and storage, waste disposal, mining, and water management. Laboratory and field experiments are currently under way to develop basic technology and to evaluate proposed applications. This supplement to bibliography, TID-3522 (9th Rev.), contains 250 annotated references to reports and published literature on the USAEC's Plowshare Program that were published in Volume 25 (1971) of Nuclear Science Abstracts. The references are arranged by subject category. Report Number and

Availability, Film and Tape, Author, and Experiment Indexes are included. (See also W73-07763) (Houser-ORNL) W73-07764

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE FORKED RIVER NUCLEAR STATION UNIT 1. Directorate of Licensing (AEC), Washington, D.C.

For primary bibliographic entry see Field 05G. W73-07767

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO CONSTRUCTION OF THE WM. H. ZIMMER NUCLEAR POWER STATION. Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 05G.

MARINE RADIOECOLOGY, A SELECTED BIBLIOGRAPHY ON NON-RUSSIAN LITERA-

Environmental Protection Agency, Seattle, Wash. E. Edmundson, Jr., V. Schultz, and A. W.

Klement, Jr. Available from NTIS, Springfield, Va., as TID-3917 (Suppl. 1); \$3 in paper copy, 95 cents in microfiche. Report TID-3917 (Suppl. 1), 1972. 76 p, 845 ref.

Descriptors: "Nuclear wastes, "Fallout, "Estuarine environment, "Radioecology, "Bibliographies, Marine biology, Water pollution sources, Radioactive wastes, Path of pollutants, Water pollution effects, Radioisotopes, Radioactivity techniques, Radioactivity effects, Marine animals, Marine plants, Sea water, Brackish water, Food chains.

Most major publications excepting progress reports are listed. Indexing is according to the first author. Abstracts are not given. References generally reflect the style of the source (Nuclear Science Abstracts, 1969-1971, other abstract publications, bibliographies, and reviews). Russian publications are listed in a companion report, TID-3915 (Suppl. 1). The coverage includes the origin (source) of environmental radionuclides. (Bopp-ORNL) W73-07769

1971 ENVIRONMENTAL RADIATION LEVELS IN THE STATE OF NEW JERSEY, New Jersey Dept. of Environmental Protection, Trenton. Div. of Environmental Quality.

D. E. McCurdy. 1971 Annual Report, February 1973. 212 p, 22 fig,

Descriptors: *Nuclear powerplants, *Effluents, *Radioactivity, *Radioisotopes, *Environment, *Monitoring, Public health, Ecology, Ecosystems, Assay, Delaware River, New Jersey, Water pollution, Air pollution, Water pollution sources, Cesium, Strontium, Tritium, Cobalt, Regulation, Legal aspects, Administrative agencies, Surface waters. Identifiers: *Oyster Creek Nuclear Powerplant, *Oyster Creek, *Barnegat Bay.

Due to public controversy concerning the radiological health and radioecological hazards of nuclear power generating stations, the Bureau of Radiation Protection did an extensive environmen-Radiation Protection did an extensive environmental radiation surveillance of the Oyster Creek Nuclear Power Generating Station. An increase in effort was placed on the surface air surveillance, analysis of potable water supplied, radiostrontium content of pasteurized milk, and radionuclide concentrations of the Delaware River. A total of twenty streams and eight stations along the upper Delaware River were sampled and analyzed during this report period. Also, a total of twenty-one potable water supplies throughtout the State were tested for radioactivity and were found to be within Federal Guidelines. Pasteurized milk supplied to the Trenton and Camden metropolitan areas was found to contain detectable quantities of the fallout radionuclides Cesium-137 and Stronti-um-90. Six fallout radionuclides in Trenton surface air were measured during the latter half of 1971. Benthic algae and aquatic plants of Barnegat Bay near the Oyster Creek Nuclear Generating Station were found to have incorporated Co60, Co58, and Mn54 in levels much greater than background specimens. Detailed data for the surveillance program are given. (Houser-ORNL)

SURVEY OF ENVIRONMENTAL RADIOAC-TIVITY.
Minnesota State Dept, of Health, Minneapolis

Report COO-651-88, Feb 1973. 56 p.

Descriptors: *Reactor powerplants, *Effluents, *Radioactivity, *Survey, *Monitoring, Air pollution, Water pollution, Water pollution sources, Soil contamination, Radioisotopes, Tritium, Iodine, Strontium, Cesium, Measurement, Milk, Food chains, Public health, Minnesota, Rivers, Sampling. Identifiers: Elk River Reactor (BWR).

The surveillance program is concerned primarily with the Elk River Reactor Site and the subsequent removal and disposition of the reactor facilities. The principal activities are concerned with: (1) Program plan and procedures for removal; (2) Surveillance of reactor systems during dismantling; (3) Facility modifications for dismantling; and (4) Removal and disposal of reactor components. (Houser-ORNL.) W73-07771

C-14 CONCENTRATIONS IN THE SOUTHERN

OCEANS, Washington Univ., Seattle. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-07773

AMCHITKA RADIOBIOLOGICAL PROGRAM PROGRESS REPORT, MAY 1971 TO FEB. 1972, Washington Univ., Seattle, Lab. of Radiation E. E. Held.

Available from NTIS, Springfield, Va., as NVO-269-17; \$3.00 in paper copy, \$0.95 in microfiche. Report NVO-269-17, Oct. 1972, 52 p, 5 fig, 19 tab, 4 ref.

Descriptors: *Nuclear wastes, *Fallout, *Monitoring, *Nuclear explosions, *Alaska, Food chains, Path of pollutants, Gamma rays, Sampling, Analytical techniques, Bioindicators, Crabs, Salmon, Mosses, Lichens, Sessile algae, Marine algae, Marine fish, Suspended solids, Colloids, Absorption, Radioisotopes, Tritium, On-site investigations, Spectroscopy.

Identifiers: Iron radioisotopes, Zirconium radioisotopes.

No release of radioactivity as a result of the Cannikin test was found, although radioactivity from world-wide fallout was detected by gamma spectrometry of indicator organisms (seaweeds in the intertidal zone, moss and higher plants in the streams, and lichen). The most abundant radionuclide detected by Millipore-filter sampling of particulates at intertidal and freshwater stations was Z495-Nb95. The sensitivity was about 0.001 picoCurie/filter (a thousand-fold better than by a direct gamma probe with a one-hour count). Fe55 in canned salmon from the 1971 Bristol-Bay pack falls within the range for fish muscle sampled in 1969-1970. Tritium levels in salmon and marine in-

Group 5B-Sources of Pollution

vertebrates (king crab, stone crab, scallops, shrimp) for the Amchitka region were comparable to other Alaskan areas. (Bopp-ORNL) W73.07724

EVALUATION OF HAZARDS AND CORROSION OF BURIED WASTE LINES IN NATIONAL REACTOR TESTING STATION SOILS, Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.

E. Paige, F. A. Siedenstrang, and M.R. Niccum. Available from NTIS, Springfield, Va., as ICP-1013; \$3.00 per copy, 30.95 microfiche. Report ICP-1013, September 1972, 238 p. 8 fig, 6 tab, 29 ref., 9 append. AEC-AT (10-1)-1375 S-72-1.

Descriptors: "Nuclear wastes, "Pipelines, "Leakage, "Monitoring, Corrosion control, Soil chemical properties, Perched water, Hazards analysis, Stainless steel, Idaho, Safety, Public health, Building codes, Standards, Tunnels, Underground, Water loss, Underground structures, Conveyance structures, Construction, Cathodic protection, Radioactivity, Soil water, Resistivity, Reviews, Environmental effects.

Encasements, which protect highly radioactive waste lines from external corrosion and provide monitoring capabilities, are discussed, including existing encasements at the Chemical Processing Plant. Existing cathodic protection systems and means of upgrading them to prevent leaks in buried waste lines are described. Soil properties which affect appreciative and infiltration from control of the processing the processing the processing and the processing med waste lines are described. Soil properties which affect corrosivity, and infiltration from corrosion-type leaks are reviewed. All buried waste lines are categorized and a surveillance program was established for hazardous lines which might pollute the environs. (Bopp-ORNL) W73-07775

ENVIRONMENTAL RADIOACTIVITY SUR-VEILLANCE GUIDE.

REMILANUE GUIDE. Environmental Protection Agency, Washington, D.C. Office of Radiation Programs. For primary bibliographic entry see Field 05A. W73-07776

ACTIVATION ANALYSIS OF MERCURY IN ENVIRONMENTAL STUDIES, Royal Inst. of Tech., Stockholm (Sweden). Dept.

of Nuclear Chemistry.
For primary bibliographic entry see Field 05A.
W73-07777

ENVIRONMENTAL RADIOACTIVITY IN

ENVIRONMENTAL RADIOACTIVITY IN DENMARK IN 1971, Danish Atomic Energy Commission, Riso (Denmark). Health Physics Dept.
A. Aarkrog, and J. Lippert.
Available from NTIS, Springfield, Va., as RISO-265; \$3.00 paper copy, \$0.95 microfiche. RISO Report No 265, June 1972. 100 p, 44 fig, 80 tab, 18 ref, 3 append.

Descriptors: "Measurement, "Fallout, "Radioactivity, "Assay, Water, Food chains, Diets, Water, Precipitation (Atmospheric), Toxicity, Public health, Air pollution, Water pollution, Water pollution sources, Human pathology. Identifiers: "Denmark."

Measurement of fall-out radioactivity in Denmark in 1971 is discussed. Sr-90 was determined in sam-ples of precipitation, soil, water, grass, milk, grain, bread, potatoes, vegetables, fruit, total diet, and human bone. Furthermore Sr-90 was deter-mined in local samples of air, rain water, grass, sea plants, fish, and meat. Cs-137 was determined in soil, milk, grain products, potatoes, vegetables, fruit, total diet, and meat, and Cs-137 was measured by whole-body counting in persons from a control group at Riso. Estimates of the mean con-tents of radiostrontium and radiocaesium in the

man diet in Denmark in 1971 are given. Some human diet in Denmark in 1971 are given. Some shorter-lived fission products were determined by Ge-gamma-spectroscopy in air filters. The gamma-background was measured regularly at locations around Riso, at ten of the State experimental farms and in an area in Zealand, one in Jutland where future nuclear power plants might be located and along the shores of the Great Belt. Regular surveys of environmental samples fro the Riso area also are included. (Houser-ORNL) W73-07779

AN INTERIM SUMMARY OF TRITIUM DATA FOR STS 'A', AMCHITKA ISLAND, ALASKA, JULY 1, 1970 THROUGH JUNE 30, 1971,

Teledyne Isotopes, Las Vegas, Nev. E. H. Essington.

Available from NTIS, Springfield, Va., as NVO-1229-172; \$3.00 paper copy, \$0.95 microfiche. Re-port No NVO-1229-172, Sept 1971. 75 p, 9 fig, 6 tab, 5 ref, 2 append.

Descriptors: "Nuclear explosions, "Underground, "Nuclear engineering, "Construction, "Fallout, "Tritium, Soil contamination, Water pollution, Water pollution sources, Data collections, Assay, Comparative productive, ***Pata collections, Assay, Identifiers: **Amchitka Island.

Extensive sampling programs were conducted at Amchitka Island, Alaska, to ascertain the levels of radioactivity in the land-surface and near-shore ocean waters. Results of tritium analyses for the period of July 1, 1970 through June 30, 1971, are tabulated. These data along with summaries of data reported in prior years are used to determine if explosion-produced radioactivity has been deposited in environmental waters by the Milrow deposited in environmental waters by the Milrow event executed 2 October 1969. Comparing tritium levels in post-Milrow water sources to (1) the same water sources pre-Milrow, and (2) similar but distant water sources post-Milrow, no detectable radioactivity has been deposited in the environ-ment by the Milrow event. Reference levels of tritium and gross radioactivities were established for various water source types for comparison to future underground nuclear events at Amchitka Island. (Houser-ORNL)

EVALUATING THE HAZARDS OF GROUND-WATER CONTAMINATION BY RADIOACTIVI-TY FROM AN UNDERGROUND NUCLEAR EX-

PLOSION, California Univ., Livermore, Lawrence Liver-

H. B. Levy Available from NTIS, Springfield, Va., as UCRL-51278; \$3.00 in paper copy, \$0.95 in microfiche. Report UCRL-51278, September, 1972. 23 p, 2 tab, 36 ref.

Descriptors: *Nuclear explosions, *Water pollu-tion, *Groundwater movement, *Radioisotopes, Absorption, Dispersion, Computer programs, Mathematical studies, Equations, Numerical anal-ysis, Fracture permeability, Hydrology, Aquifers, Path of pollutants.

This review discusses factors affecting the availability of radioactivity to groundwater after flooding of the nuclear-explosion crater (chimney). Radionuclide transport through groundwater is described by equations for the special cases in which either sorption by rock or geometric disper-sion is negligible, and for the general case in which both are important. Citations are made to Fortran listings of computer codes and to effects from nonhomogenities in aquifer properties. (Bopp-ORNL) W73-07782

RADIOACTIVE WASTE PROCESSING AND DISPOSAL.
Technical Information Center (AEC), Oak Ridge,

Available from NTIS, Springfield, Va., as TID-3311 (Suppl. 4); \$3.00 in paper copy, \$0.95 microfiche. Report TID-3311 (Suppl. 4), January 1973. 119 p, 464 ref.

Descriptors: *Bibliographies, *Water pollution sources, *Surface waters, *Nuclear wastes, Seas, Path of pollutants, Soil contamination, Radioisotopes, Eavironmental effects, *Waste disposal, Waste water treatment, Cobalt radioisotopes, Strontium radioisotopes, Sediments, Uranium radioisotopes, Radioactive wastes, Radioactivity effects, Tritium, Waste storage, Monitoring, Gamma rays. Identifiers: Plutonium, Cesium radioisotopes, Zirconium radioisotopes, Ruthenium radioisotopes, Cerium radioisotopes, Environmental impact statements.

Among the subjects indexed in this bibliography, those related to water pollution include surface waters (5 refs.), seas (9), soil contamination (2), and environmental effects (23). The citations are arranged by the original Nuclear Science Abstract number. The subject indexing is displayed under each citation to serve as a substitute for an abstract. (Bopp-ORNL) W73-07783

AN AUTOMATIC LIQUID-PHASE RADIOANALYSER (RADIOANALYSEUR AUTOMATIQUE EN PHASE LIQUIDE), sariat a l'Energie Atomique, Montrouge For primary bibliographic entry see Field 05A. W73-07784

ENVIRONMENTAL SURVEILLANCE AT HAN-ENVIRONMENTAL SURVEILLANCE AT HAN-FORD FOR CY-1971 DATA, Battell-Pacific Northwest Labs., Richland, Wash. P. E. Bramson, and J. P. Corley. Available from NTIS, Springfield, Va., as BNWL-1683 (Addendum). \$3.00 paper copy, \$0.95 microfiche. Report BNWL-1683 (Addendum), Au-gust 1972, 95 p, 53 tab, 11 append.

Descriptors: *Nuclear powerplants, *Radioactivity, *Air pollution, *Water pollution, *Water pollution sources, *Soil contamination, Radioisotopes, Assay, Data collections, Analytical techniques, Documentation, Public health. Identifiers: Surveillance program, Hanford site.

This supplemental report is a compilation of results obtained from both analyses of environmental samples and from radiological measurements made in the Hanford environs during 1971. The significance of these data is discussed in the The significance of these data is discussed in the parent report (BNWL-1683). The term 'analytical limit' as used in this report is the concentration at which the laboratory can measure the radionuclide with a precision of plus or minus 100% at the 90% confidence level. The detection limit for a specific radionuclide varies with sample type, sample size, counting time, and the amounts of interfering radionuclides present. The 'analytical limits' were chosen to represent upper bounds to these fluctuating detection limits. (Houser-ORNL) W73-07785

DISPOSAL OF DIGESTED SLUDGE, West Hertfordshire Main Drainage Authority, Rickmansworth (England). For primary bibliographic entry see Field 05E. W73-07788

TOC: HOW VALID IS IT, Beckman Instruments, Inc., Fullerton, Calif. R. H. Jones.

Water and Wastes Engineering, Vol 9, No 4, p 32-33, April, 1972. 2 fig, 6 ref.

Descriptors: "Biochemical oxygen demand, "Organic wastes, Chemical oxygen demand, Sampling, Pollution abatement, Analytical techniques, Water quality, Water quality control, "Monitoring, Oxygen, "Carbon, Pollutant identification, Water pollution sources. Identifiers: "Total organic carbon.

A correlation of carbon based results and oxygen based results is necessary if Total Organic Carbon (TOC) is to have direct use for waste characterization and water quality monitoring. The TOC analysis offers many potential advantages for the measurement of organic pollution since it measures the carbon present in organic waste substances. It also eliminates many of the variables that confound oxygen based tests and furthermore, there is a distinct advantage to the reduced time lag between sample collection and analysis. However, the TOC analysis does have a major limitation and that is the fact that results are unfamiliar to investigators and a correlation of carbon based results and oxygen based results is necessary if it is to have direct use for waste characterization and water quality monitoring. (Smith-Texas)

5C. Effects of Pollution

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EFFECTS OF WATER DIVERSION ON ESTUARINE FAUNA IN THE MERRIMACK RIVER, MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management. C. F. Cole.

C. F. Cote.

Available from the National Technical Informa-tion service as PB-218 675, \$3.00 in paper copy, \$0.95 in microfiche. Massachusetts Water Resources Research Center, Final Report, Sep-tember 1972, 10 p, 5 ref. OWRR A-038-MASS (1).

Descriptors: Anadromous fish, Fish passages, Fish migration, Life history studies, Estuaries, Marine fisheries, *Diversion, Alteration of flow, Atlantic salmon, *Benthic fauna, Demersal fish, *Estuarine fisheries, Commercial fish, *Massachusetts, Fish ladders, Herrings, Identifiers: Yellowtail flounder, American shad, Alewife, Nearshore fishes, Limanda, Fish restoration, *Merrimack River (Mass).

Some of the biological effects were investigated of a proposed Corps of Engineers' freshwater diversion to the Boston Mass. water supply from the Mertimack River. The project complemented an ongoing Corps study on riverine fauna by examining nearshore fisheries resources including yellowail flounder, winter skate and land dab. Detrital discharge by the river is of probable importance in the nearshore benthic food web supporting large populations of yellowail flounder and other benthic fishes. A year long sampling showed no major change in the benthic piscine community since 1963. A survey of anadromous fish passage facilities on the river recaled badly deteriorated ladders at the Lawrence and Lowell dams. The proposed diversion of water may reduce attraction capabilities for returning shad, Atlantic salmon and alewives and thereby reduce probable successful reintroductions and ladder restorations. W73-07153

ECOLOGICAL MONITORING OF STREAM STATEMS, Michigan Univ., Ann Arbor. Dept. of Wildlife and Fisheries. For primary bibliographic entry see Field 02I. W73-07156

A PHYSICAL CHEMICAL AND BAC-TERIOLOGICAL ANALYSIS OF FRESH-

WATER LAKES IN THE SCHIERMACHER OA-SIS, (IN RUSSIAN), R. Yu. Tashpulatov, A. I. Ionin, and O. K. Sedov. Inf Byull Sov Antarkt Eksped. 80, p 98-104. 1970. Identifiers: Antarctic, Bacteria, Biological proper-ties, Chemical properties, Fresh water, *Lakes, Minerals, Physical properties, *Schiermacher oa-

sis.

Heterotrophic microflora was studied in 2 small lakes in the region of the Novolazarevaja Station (Antarctica) which are fed by the melting of snow and the edge of the ice slopes. Temperature, transparency, pH, NH4, nitrites, nitrates, Ca, Mg, and Po were determined in samples taken from the surface, center and bottom layers during various seasons. Bacterial analysis was carried out by sowing on membrane filters placed on the surface of meat peptone agar and Endo Medium. Incubation at 37 degree C lasted for 18-20 hr and at 4 degree C, for 8-10 days. Melt water was studied for comparison. The lakes near the station differed sharply in its high content of microorganisms (10 to the sixth power - 10 to the seventh power/ml) with gram negative forms predominating, and in its physical and chemical properties. The amount of bacteria increased in the beginning of spring and decreased during active snow thawing. The chemical composition of the water also changed. Two of the isolated strains were able to reproduce at +4 degree C with low content of organic substances (1 ml of meat peptone broth/499 ml of distilled water). One of these is considered an antarctic microflora since it can reproduce in distilled water. The other may be the result of water pollution.—Copyright 1972, Biological Abstracts, Inc. W73-07166

ECOLOGICAL SEPARATION OF COEXISTING SPECIES OF WINTER STONEFLIES, AL-LOCAPNIA SPP. (PLECOPTERA: CAPNIIDAE). Purdue Univ., Lafayette, Ind. Water Resources Research Center.

G. R. Finni.
Ph.D. Thesis, 1972. 204 p, 49 fig, 31 tab, 96 ref.
OWRR-A-005-IND (17).

Descriptors: *Stoneflies, *Aquatic insects, Insects, *Indiana, Distribution, Ecological distribusects, Indiana, Distribution, Ecological distribu-tion, Ecology. Identifiers: Winter stoneflies, Allocapnia, Little Pine Creek (Indiana), Warren County (Indiana).

The ecology of Allocapnia species was studied on Little Pine Creek, Indiana from 1967-1972. The objective was to determine the factors relating to their distribution and abundance. Substrate and current were initially determined to be of greatest importance in determining the microdistribution of the naiads. Further studies were conducted to determine specific life history phenomena and phenomena permitting species coexistence. Three species, A. recta, A. granulata and A. vivipara composed over 90% of the total. A. recta was an early winter developing and emerging species, whereas, A. granulata and A. vivipara coemerged as mid to late species. These two species were found to have a differential physiological response to microenvironmental conditions. A key is provided to separate the 11 species of Allocapnia adults known to occur in Indiana.

W73-07170

COMPARATIVE LIMNOLOGY AND PHYTOPLANKTON ECOLOGY OF FOUR 'OLIGOTROPHIC' LAKES IN OREGON, U.S.A., WITH EMPHASIS ON LAKE TYPOLOGY, Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.

D. W. Larson

Northwest Science, Vol 46, No 2, p 149-163, 1972. 6 fig, 6 tab, 37 ref. OWRR-A-001-ORE (16).

Descriptors: Limnology, *Oligotrophy, *Lakes, Phytoplankton, *Classification, *Oregon, Biomass.

The literature indicates that at least four lakes in Oregon are classified as 'oligotrophic' - Crater (Donaldson, 1968), Odell (Newcomb, 1941; Averett, 1966), Waldo (Crater et al., 1966) and Woahink (Gahler, 1969). In comparing these lakes, considerable differences were noted concerning basin origin, surface elevation, waterabed features, morphometry, optical and chemical properties, and how the lakes were being used. Despite the diversity, however, each lake featured many limnological properties (Welch, 1952; Ruttner, 1953) that denoted oligotrophy. This study evaluates the classification 'oligotrophic' as applied to the four lakes. It considers the various edaphic, morphometric, climatic, and cultural factors that acted upon the lake environments and discusses the difficulty of classifying lakes using the familiar oligotrophic-mesotrophic-eutrophic categories. Specific objectives were to document, further, the limnology of these unusual lakes and to determine the extent to which biological production and biomass-particularly with regard to the phytoplankton-might differ among them.

USE OF CS-133 AND ACTIVATION ANALYSIS FOR MEASUREMENT OF CESIUM KINETICS IN A MONTANE LAKE, Colorado State Univ., Fort Collins. Dept. of Radiology and Radiation Biology. T. E. Hakonson, A. F. Gallegos, and F. W.

Neicker: Available from the National Technical Informa-tion Service as COO1156-41, \$3.00 in paper copy, \$0.95 in microfiche. Master's thesis (undated). 22 p, 5 fig, 8 ref. 1971 AEC COO-1156-41.

Descriptors: "Analytical techniques, "Cesium, "Kinetics, "Lakes, Colorado, Tracers, Trout, Neutron activation analysis, Pallout, Radioisotopes, Toxicity, Public health, Lethal limit, Sampling.
Identifiers: "East Twin Lake (Colo), Cs-133, Cs-

Levels of fallout radionuclides in Colorado trout directed an intensive study of East Twin Lake because of the Cs-137 persistence. A compartmental kinetics experiment using stable Cs-133 as a tracer is described. Although use of radioactive Cs-134 was technically feasible, the use of stable cesium eliminated prohibition of fishing. Amount of tracer needed to give detectable Cs-133, determination of the acute chemical toxicity to organisms, and considerations that it might not exhibit the same kinetic behavior were all studied. After introduction of the initial Cs-133, samples of water, detritus, seston, vegetation, invertebrates, and trout were removed from the lake at graduated time intervals. Cesium concentrations were measured in approximately 10 gram samples by neutron activation analysis. Samples were exposed four hours to a thermal neutron flux and after a four week decay period, Cs-134 could be measured in all samples with 4 x 8 inch Nal (Ti) crystal-pulse height analyzer system. Preliminary data suggest that the stable cesium tracer technique appears feasible, although analysis of Cs-133 in sediment may prove to be relatively difficult with the Nal (Ti) detection system. (Iones-Wisconsin)

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station. R. G. Wetzel.

Available from the National Technical Informa-tion Service as COO-1597-55 Pt. 1, \$3.00 in paper copy, \$0.95 in microfiche. Technical Progress Re-port, April 1972. 42 p, 2 fig, 6 tab, 43 ref. AEC AT (11-1)-1599.

Descriptors: *Carbon cycle, *Organic matter, *Lakes, *Metabolism, *Productivity, Nutrients,

Group 5C-Effects of Pollution

Photosynthesis, Carbon, Energy, Chemical properties, Geese (Wild), Wildlife, Hardness (Water), Carbonates, Marl, Nitrogen, Detritus, Benthos, Decomposing organic matter, Model studies. Identifiers: Pelagic zone, Lawrence Lake (Michigan), Dissolved organic carbon, Particulate organic carbon, Particulate

Interactions of dissolved organic matter with inor-ganic nutrient cycling and regulation of metabol-ism of micro- and macroflora are studied with total ism of micro- and macroflora are studied with total carbon budget, major pathways of energy flow, and control mechanisms at chemical-producer-decomposer levels in several lakes. In conjunction with fractionation and lability analyses of dissolved organic carbon and dissolved organic introgen by high intensity ultraviolet irradiation, particulate and colloidal calcium carbonate is being generated by induced precipitation from both sterile and non-sterilized lake water and from synthetic lake water and from synthetic lake water media. Advanction fractions both sterile and non-sterilized lake water and from synthetic lake water media. Adsorption fractions is being determined. A strong inverse correlation was found between past productivity and amount of carbonate sedimented from two marl lakes. Lawrence Lake, Michigan core is being C-14 dated for analysis of sedimentation rates. Detrital metabolism represents a complex carbon cycle.

Benthic respiration was determined by direct in situ carbon dioxide measurements. Respiration stut carbon dioxide measurements. Respiration and photorespiration by submersed angiosperms, macrophytic decomposition, productivity, and secretion of dissolved organic matter, an algal production model, and aerial allochthonous inputs were studied. Dynamics of dissolved and particulate nitrogen in oligotrophic Lawrence and hypereutrophic Wintergreen lakes have been analyzed. (Jones-Wisconsin) W73-07181

UTILIZATION OF ALGAE FOR WATER PU-RIFICATION AND PROTEIN PRODUCTION, California Univ., Berkeley. Lawrence Berkeley

S. F. Miller, and C. R. Wilke.

Available from National Technical Information Service as LBL-289, \$3.00 in paper copy, \$0.95 in microfiche. Master's Thesis (LBL-299) January 1972. 100 p, 18 fig, 9 tab, 16 ref, 4 append. AEC W-

Descriptors: *Harvesting of algae, *Algae, *Water purification, *Proteins, Economic feasibility, Foods, Ion exchange, Strontium, Radioactive wastes, Computer programs, Cations, Separation techniques, Harvesting, Absorption, Optimization, Amino acids, Water treatment Pilot placets. tion, Amino acids, Waste treatment, Pilot plants.
Identifiers: *Utilization of algae, Pandorina
morum, Nucleic acid, Phototactic separation.

The use of algae, specifically Pandorina morum, as ion exchange beads for removal of strontium from low level radioactive waste streams was investigated and an economic analysis of a plant for this treatment made. The algae process was more costly than conventional ion exchange processes the primarily to the excess of a personnel algae. costly than conventionan in extrange processor due primarily to the expense of separating algae from dilute suspensions; phototaxis, utilizing Pandorina's tendency to swim towards light, as a separation mechanism at a reduced cost was also investigated. Application of algae as ion exchange beads demonstrated that the kinetics of absorption is sufficiently fast so that equilibrium is obtained in less than two minutes; another experiment in-dicated that the mechanism for cation uptake is probably ion exchange. Plant design was compared for treating 1000 gallons of low level radioactive waste every two minutes; the process employing algae as ion exchange beads costs three nes as much as conventional ion excha times as much as conventional ion exchange. Cheap means of separation would not only increase the feasibility of the algal process but would also lower the cost of producing algae as food. An analysis of Pandorina morum showed that 28.3%-40.4% of the dry weight can be removed as amino acids. Further investigation of Pandorina as a food sources is warranted. (AuenW73-07182

Genesee/Finger Lakes Regional Planning Board, Rochester, N.Y.

Available from the National Technical Informa-tion Service as PB 211-040, \$9.00 in paper copy, \$0.95 microfiche. Report No 12, June 1971. 113 p, 15 photos, 18 ref., 7 append.

Descriptors: *Lake Ontario, *Shores, *Regional analysis, *Planning, Ecology, Land management, Economic impact, Comprehensive planning, Watersheds (Basins), Social aspects, Water quality, Water pollution sources, Vermont, New York, Wisconsin, Agriculture, Industrial production, Wetlands, Nuclear powerplants, Regulation, Water pollution effects, Eutrophication, Thermal pollution.

pollution. Identifiers: Monroe County (N.Y.), Orleans County (N.Y.), Wayne County (N.Y.), Genessee River (N.Y.), Irondequoit Bay (N.Y.), Braddock Bay (N.Y.).

Complexities of problems which beset communities on the immediate shore and within the creek
and river watersheds draining directly into Lake
Ontario are described. The state of scientific
knowledge of the lakeshore is examined, particularly the base line data necessary to determine efects of nuclear powerplants, existing and
proposed. Recommendations are given for
uniform health, sanitation, and building codes and
heir effective enforcement. Existing legal tools
should be used to secure improved public access
to the lake and bayshores, to secure more public
open space, upgrade shoreline aesthetics, and
generally improve land use taking into account environmental restraints. Vermont and Wisconsin
studies are described. Although basic scientific
data has been collected for limited parts of the
shoreline, it is considered inadequate. Working shoreline, it is considered inadequate. Working through and within cottagers' and bay associa through and while the starting point in community education on shoreline environmental problems. The ultimate aim is to create a comprehensive plan to guide future growth and development of this region. Certain measures can be taken, specifically those affecting measures can be taken, specificary under an ecovery the shoreline, to start it on environmental recovery or at least to fight a holding action against further abuse. (Jones-Wisconsin) W73-07184

PHYTOPLANKTON DYNAMICS IN THE DELAWARE RIVER ESTUARY, Millersville State Coll., Pa.

R. L. Heffner. Master's thesis, May 1971. 43 p, 14 fig, 4 tab, 24

tors: *Seasonal, *Phytoplankton, nics, *Estuaries, Delaware River, Pennsyl-Descriptors: *Dynamics, *Estuaries, Delaware River, Pennsylvania, Heated water, Thermal powerplants, Dominant organisms, Limiting factors, Organic loading, Chlorophyta, Cyanophyta, Algae. Identifiers: *Phytoplankton pulse, Actinastrum hantzchii, Asterionella formosa, Coscinodiscus subtilis, Fragilaria crotonensis, Fragilaria vaucheriae, Melosira ambigua, Melosira distans, Melosira granulata, Synedra rumpens.

Samples were taken for a phytoplankton study (qualitative and quantitative) at three generating plants on the Delaware River Estuary near Philadelphia. Collections were made where temperature was 2C above ambient river water and perature was 2C above ambient river water and also where water was not under direct influence of the heated discharge at each site. Temperature and pH were recorded and phosphates, nitrates, amonia, dissolved oxygen, alkalinity, chlorides, and biochemical oxygen demand determined. The thermal effect of the generating plants was negligible in the phytoplankton results. Neither the phytoplankton pulses at any of the sites nor the increased abundances found at the downstream sites could be correlated or predicted from the observed nutrient levels. The phytoplankton was predominantly diatoms throughout the year with green algae becoming significant only during the summer months and blue-green algae forming a minor portion throughout the study. The peak abundances (arthebung status) of the dominant species appeared to be more seasonal than based on nutrients since nutrient levels remained fairly constant. Whenever a phytoplankton pulse was observed the arthebung species comprised 70% or more of the observed sample. (Jones-Wisconsin) W73-07182

RELATIONSHIPS BETWEEN CELL-WALL FRACTIONS, NITROGEN, AND STANDING CROP IN AQUATIC MACROPHYTES, Savannah River Ecology Lab., Aiken, S.C. J. M. Polisini, and Claude E. Boyd. Ecology, Vol 53, No 3, p 484-488, 1972. 2 tab, 25 ref. AEC AT (38-1)-310.

Descriptors: "Digestion, "Nitrogen, "Standing crops, "Aquatic plants, "Energy conversion, Herbivores, Proteins, South Carolina, Diets, Analytical techniques, Floating plants, Rooted aquatic plants, Separation techniques, Trophic level. Identifiers: "Cell-wall fractions, Savannah River (S.C.), Shoots, Nutritive quality, Neutral-detergent procedure.

The difference in quantity and quality of aquatic plant production is important in determining the efficiency with which matter and energy are transefficiency with which matter and energy are trans-ferred to the trophic levels. The digestibility of aquatic macrophytes was estimated and considera-tion given to the relationships between shoot standing crop and nutritive quality. Shoot samples of 21 species of aquatic macrophytes were separated into cell-wall and noncell-wall fractions by digestion in a neutral detergen solution. Nitrogen analyses were also made on the fiber remaining after neutral-detergent-soluble comng after neutral-detergent-soluble onents were removed. Data for initial and fiber ponents were removed. Data for initial and fiber nitrogen and dry matter solubility in neutral-detergent were used to calculate the solubility of nitrogen, a method useful for estimating the digestibility of plant production by native herbivores. The nitrogen content was also used as an indication of nutritive quality. Amounts of non-cell-wall material and nitrogen in the dry matter decreased as short dendire concept the difference of the decreased as shoot standing crops of the different species increased. Different parts of the same int differ greatly in nutritive quality. (Jones-

WATER TEMPERATURE MEASUREMENT WITH CHEMICAL THERMOMETERS IN LIT-TORAL AREAS OF THE CHESAPEAKE BAY, National Oceanographic and Atmospheric Ad-ministration, Silver Spring, Md. Environmental F. A. Godshall.

In: 'Preprints', Annual Conference and Exposition Marine Technology Society, September 11-13, 1972, Washington, D.C., p 575-580. 2 fig, 1 tab, 3

Descriptors: *Water temperature, *Measurement, *Thermometers, *Instrumentation, Littoral, Chesapeake Bay, Costs, Surveys.
Identifiers: *Chemical thermometers, Pullman

Chemical thermometers were used to avoid expense of recording thermometers during temperature surveys of Chesapeake Bay in the summer of 1971. The accuracy of the thermometers under the measurement conditions and various exposure measurement controlls and various exposure techniques were tested. The thermometer solution is composed of sucrose, water, hydrochloric acid and sodium citrate. When exposed to temperatures above the freezing point of the thermometer solution, the sucrose undergoes hydrolysis and is converted to glucose and fructose. Rate of this irreversible reaction is inversely proportional to the hydrogen ion concentration of the solution and proportional to the solution temperature. All the sugars are optically active in solution and their concentration can be measured optically with a polarimeter. From the variations of the optical rotation angle of the solution during exposure and the initial and final measurements of pH of the solution, the chemically-integrated mean temperature for the exposure period was obtained. The plastic bottles used were resistant to breakage and buoyant thus when the thermometers were anchored near the bottom the danger of their being silted over was lessened. Also the anchored thermometers floated at the level set by their distance from the anchor which permitted vertical distribution measurements. (Jones-Wisconsin)

THE EFFECT OF CHEMICAL WASTE ON MARINE ORGANISMS,
Marine Advisory Services, Wargrave (England).

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R. C. Newell.

R. C. Newell. Effluent Water Treatment Journal, Vol 12, No 6, p 307-311, 1972. 4 fig, 2 tab, 16 ref.

Descriptors: *Water pollution effects, *Chemical wastes, *Marine animals, *Marine plants, Oceans, Bottom sediments, Toxins, Effluents, Lethal limit, Heavy metals, Chlorinated hydrocarbon pesticides, Polychlorinated byphenyls, Strontium, Food chains.

Food chains.

The shallow ocean waters of the continental shelf are the most vulnerable to toxins derived from land. Almost any industrial effluent discharged via an estuary or directly into the sea itself is likely to have some effect on local organisms. It is comparatively simple to assess toxicity and the 'zone of acute toxicity' may be predicted fairly accurately as apparently harmless concentrations of persistent toxins discharged into the sea may become concentrated to harmful levels. Chlorinated hydrocarbons, polychlorinated biphenyls, and the salts of heavy metals possess the necessary chemical stability to accumulate and concentrate, affecting a variety of processes including growth and development of animals at low trophic levels in the community. Predators (larger fishes, birds, mammals, including man) high in the food chains are threatened with potent and immediate danger from the cumulative effects in food chains. Industrial development of the sea bed need not necessarily proclude existence of the great variety of invertebrates and fishes living in the shallow seas around coasts. If the sea is to be used as a major source of uncontaminated protein, far-reaching measures must be adopted to prevent discharge of apparently sublethal concentrations of persistent toxins. (Jones-Wisconsin)

RIVER-OCEAN NUTRIENT RELATIONS IN

SUMMER, Washington Univ., Seattle. Dept. of Oceanog-

raphy. T. J. Conomos, M. G. Gross, C. A. Barnes, and F.

T. J. Conomos, M. G. Gross, C. A. Barnes, and F. A. Richards.
In: The Columbia River Estuary and Adjacent Ocean Waters Bioenvironmental Studies, p 151-175. 16 fig. 4 tab, 38 ref. University of Washington Press, Seattle, 1972. AEC AT (45-1)-1725.

Descriptors: *Rivers, *Nutrients, *Mixing, Estuaries, Oceans, Columbia River, Tides, Pacific Ocean, Upwelling, Salinity, Silicates, Photosynthesis, Nitrates, Phosphates, Temperature, Circulation, Winds, Currents (Water).

An intensive study of the Columbia River effluent system disclosed interactions between a major river and adjacent ocean. Mixing processes near the river mouth were studied using vertical variations.

tions of temperature, salinity, and nutrient concentrations to distinguish different water parcels and show qualitatively their movement. Mixing largely is a two-stage process affected by river discharge and tides. Mixing zones are displaced seaward at high river discharge. First mixing stage occurs in the estuary and involves fresh river water and upwelled subsurface ocean water flowing into the estuary above the bottom. River water contributes most silicate and a relatively minor amount of phosphate whereas inflowing subsurface oceanic water contributes essentially all nitrate, most phosphate, and some silicate. Resultant low-salinity mixture flowing from the estuary as a surface layer is less dense, lower in silicate but slightly higher in phosphate and much higher in nitrate. Second mixing stage occurs in the transition area seaward of the river mouth where seaward-moving low-salinity water induces upwelling of deeper subsurface oceanic water. In the peripheral oceanic area essentially no surface water replenishment of nutrients by vertical mixing exists; nutrients perhaps supplied by such mixing exists; nutrients perhaps supplied by such mixing are utilized at greater depths by photosynthesis with resulting nitrate depletion which eventually limits photosynthesis. (Jones-Wisconsin) W73-07189

VARIABILITY OF SALINITY AND NUTRIENTS OFF THE COLUMBIA RIVER MOUTH, Washington Univ., Seattle. Dept. of Oceanog-

Washington Univ., Seause. Dept. of Schaufgraphy.
A.C. Duxbury.
In: The Columbia River Estuary and Adjacent Ocean Waters Bioenvironmental Studies, p135-150. 11 fig, 1 tab, 4 ref. University of Washington Press, Seattle, 1972. NR 083 012, AEC AT (45-1)-1725, ONR Nonr 477 (37).

Descriptors: "Variability, "Salinity, "Nutrients, "Columbia River, "Estuaries, Winds, Tides, Effluents, Silicates, Nitrates, Phosphates, Surface waters, See water, Mixing, Washington, Organ, Chemical properties, Temporal distribution, Chemical properties, Pacific Northwest U.S.

Variations in chemical structure of water in the Variations in chemical structure of water in the Columbia River effluent region near the river mouth occur rapidly and increase in magnitude with river discharge. Data collected by repetitive sampling showed internal oscillations of salinity and temperature surfaces which had tidal periods. Measurements were made at five stations at about 8-hour intervals, or at 4-hour intervals at one sta-Measurements were made at five stations at about 8-hour intervals, or at 4-hour intervals at one station for two days. Salinity data show the presence or absence of river effluent and local fluctuations in the water structure related to the river's influence. Although the apparent oscillations of these salinity isopleths are of tidal period, amplitudes of the oscillations and the salinity structure of the water column differ among the five positions. Besides variability, associated with the amount of diluting effluent, seasonal changes in the chemical composition of the river water must be considered, as was done with silicates. With regard to nutrients, nitrate and phosphate, the larger variation in surface values is associated with periods of larger river-discharge rates, but is not necessarily due to river nutrient contributions. Variability in concentration appears to depend also on the flow dynamics and reflects the relative extent to which the effluent mixes with surface and deeper coastal waters. (Jones-Wisconsin) W73-07190

TOTAL PHOSPHORUS AND PHOSPHORUS-32 IN SEAWATER, INVERTEBRATES, AND ALGAE FROM NORTH HEAD, WASHINGTON, Washington Univ., Seattle. Lab. of Radiation

wasnington Univ., Scattle. Lab. of Radiation Ecology. J. S. Isakson, and A. H. Seymour. In: The Columbia River Estuary and Adjacent Ocean Waters Bio-environmental Studies, p. 799-818. 8 fig, 6 tab, 24 ref. University of Washington Press, Seattle, 1972.

Descriptors: "Radioisotopes, "Phosphorus, "Distribution, "Phosphorus radioisotopes, "Sea water, "Nuclear reactors, Invertebrates, Algae, Washington, Columbia River, Seasonal, Clams, Mussels, Water pollution effects.

Lientifiers: "P-32, "North Head (Wash), Hanford reactors, Gooseneck barnacles, Sea anemone.

reactors, Gooseneck barnacles, Sea anemone.

A survey was made of the biological distribution of P-32, a radionuclide produced by the Hanford reactors. Monthly samples of seawater and of several species of invertebrates and algae were taken for a year and quantitative determinations made of P-32 and total phosphorus. Mean P-32 values were 158, 147, 16, and 27 pCilg (dry) for soft tissues of clams and mususels and for the entire organism of gooseneck barnacles and sea anemones, respectively. Mean total phosphorus values were 10, 11, 2.2, and 19 mg/g (dry). For six species of algae, mean P-32 values averaged 61 pCilg (dry) and the mean total phosphorus value was 2.3 mg/g (dry). Amounts of total phosphorus and P-32 in these samples varied independently. In general, seasonal variation in values was much more pronounced for P-32 than for total phosphorus and the peak values for the former occurred most frequently during April to June. Concentration factors by tissue for the forms of phosphorus were greatest for the G. I. tract plus contents and the digestive gland (mesosoma) of razor clams and musuels, respectively, and were least for shell. (Jones-Wisconsin)

THE USE OF ULTRA-VIOLET ABSORBANCE FOR MONITORING THE TOTAL ORGANIC CARBON CONTENT OF WATER AND WASTE-

WATER, National Environmental Research Center, Cincin nati, Ohio.

For primary bibliographic entry see Field 05A. W73-07192

BIOLOGY AND CONTROL OF AQUATIC NUISANCES IN RECREATIONAL WATERS, Wisconsin Dept. of Natural Resources, Madison. For primary bibliographic entry see Field 04A. W73-07193

DIVERSITY IN SOME SOUTH AFRICAN DIATOM ASSOCIATIONS AND ITS RELATION TO WATER QUALITY, National Inst. for Water Research, Congella (South Africa). Regional Lab. For primary bibliographic entry see Field 05A. W73-07194

DYNAMICS OF NUTRIENT SUPPLY AND PRIMARY PRODUCTION IN LAKE SAMMAMISH, WASHINGTON, Washington Univ., Seattle. Dept. of Civil En-

gineering.

E. B. Welch, and D. E. Spyridakis.

In: Proceedings of the symposium on Research on Coniferous Forest Ecosystems, March 23-24, 1972, at Bellingham, Washington, p 301-315. 5 fig, 6 tab, 23 ref. OWRR A-045-WASH (2).

Descriptors: "Trophic level, "Dynamics, "Nutrients, "Eutrophication, "Primary productivity, "Washington, Mesotrophy, Phosphorus, Pollution abatement, Cycling nutrients, Sediments, Iron, Nitrogen, Lake morphometry, Carbon, Silicates, Lakes.

Identifiers: "Lake Sammamish (Wash), Sewage

Comparison is made between Washington's Lake Sammamish and Lake Washington, both of whose nutrient supply was altered by sewage diversion and their trophic status is compared to that of other Cedar River drainage lakes. The response of Lake Sammamish to nutrient diversion differs from that of Lake Washington and mechanisms

Group 5C-Effects of Pollution

are hypothesized to explain that lake's delayed recovery. Phytoplankton biomass and productivity and nutrient content were determined in samples from several depths and a significant change in phytoplankton biomass production or water clarity were not observed. Factors controlling winter P concentrations in Lake Sammamish are not yet unconcentrations in Lake Sammamish are not yet understood but comparison of seasonal changes in
total P and morphological characteristics between
the two lakes offer a hypothesis. Lake Sammamish's recovery rate may be slower because it
had never attained the enrichment or productivity
level of Lake Washington. Annual nutrient
budgets suggest a reduction in sedimented P since
diversion but little change in the quantity of P
released from anaerobic sediment. Winter mean
content P availability in the water column appears
to be controlled by iron precipitation to a greater content P availability in the water column appears to be controlled by iron precipitation to a greater extent than in Lake Washington. In situ experiments show that nitrogen and phosphorus are equally limiting to summer phytoplankton productivity but like Lake Washington, phosphorus may be of more long-term significance. (Jones-Wisconain) W73-07195

ALKALINE PHOSPHATASE ACTIVITY IN SUB-TROPICAL CENTRAL NORTH PACIFIC WATERS USING A SENSITIVE FLUOROMET-RIC METHOD, California Univ., San Diego, La Jolla, Inst. of

Marine Resources.
For primary bibliographic entry see Field 05A.
W73-07196

SUGARS IN THE SEDIMENTS OF LAKE TRUMMEN AND REFERENCE LAKES, Lund Univ. (Sweden). Limnological Inst.

Archiv fur Hydrobiologie, Vol 70, No 3, p 302-412, 1972. 4 fig, 10 tab, 25 ref.

Descriptors: *Eutrophication, *Carbohydrates, *Sediments, *Lakes, Diatoms, Seston, Bacteria, Cellulose.

dentifiers: *Sweden, *Lake Trummen (Sweden), Hydrolyzable sugars, Galactose, Glucose, Man-nose, Arabinose, Xylose, Fucose, Ribose, Rham-nose, Deoxyribose, Fructose, Maltose, Sucrose, Sorbose, Near raffinose.

Chemical properties of sediments are indicative of long time alterations connected with waste water loadings, cooling water discharge, or lake restoration. Free and hydrolyzable sugars of Lake Trummen, Sweden, now an object of restoration, were studied, together with those of 13 other lakes of studied, together with those of 13 other lakes of several trophic levels for a regional perspective. The sugars were separated by descending unidimensional paper chromatogaraphy. The dominating free sugar was glucose followed by maltose and sucrose; also galactose, fructose, mannose, arabinose, xylose, ribose, and near rafinose' were found as free sugars. High-productive lakes showed mostly a high sugar content. The suggested explanation for this is sorption on the surfaces of diatom frustules. The following sugars were found after hydrolysis: galactose, glucose, mannose, arabinose, xylose, fucose, ribose, rhammanose, arabinose, xylose, fucose, ribose, rhammannose, arabinose, xylose, fucose, ribose, rham-nose, deoxyribose, and fructose, the latter only in noue, deoxynbose, and fructose, the latter only in a few samples. Glucose constituted the major part in seston and in Lake Trummen surface sediment, perhaps showing the loading. In oligotrophic lakes, seston sugar pattern seemed to have changed during sedimentation, as glucose was not the dominating sugar in surface sediment. There was high cellulolytic activity in the Lake Trummen surface lulolytic activity in the Lake Trummen surface sediment but cellobiose was not found. (Jones-W73-07197

INVESTIGATION OF PHOTOSYNTHETIC TRANSIENTS IN CHLORELLA VULGARIS AT DIFFERENT TEMPERATURES USING

RADIOACTIVE CO2, (UNTERSUCHUNG DES EINFLUSSES DER TEMPERATUR AUF DIE PHOTOSYNTHESE-INDUKTION BEI CHLORELLA VULGARIS MIT RADIOAKT

IVEM CO2), Frankfurt Univ. (West Germany). Botanical Inst. G. Dohler.

Planta (Berl.), Vol 107, No 1, p 33-42, 1972. 3 fig. 19 ref. English summary.

Descriptors: *Analytical techniques, *Photosynthesis, *Chlorella, *Temperature, Carbon dioxide, Kinetics, Absorption, Metabolism. Identifiers: *Photosynthesis induction, *Chlorella vulgaris, Autoradiography, Calvin cycle.

Temperature influence on initial processes of photosynthesis in Chlorella vulgaris was studied with radioactive carbon dioxide. Carbon dioxide exchange, CO2-14 fixation and radioactive products were examined at 10C and 35C. Chlorella was grown under low carbon dioxide concentration at 27C and measured with an infrared gas analyzer. At 15C and above, the maximum carbon dioxide uptake occurs at the beginning of the illumination period followed by a minimum uptake before steady rate of photosynthesis is reached. At 10C, a log lag phase without a minimum in uptake was observed which also occurs in the time course of CO2-14 fixation. In autoradiographic studies at was observed which also occurs in the time course of CO2-14 fixation. In autoradiographic studies at 10C, labeled products appearing at the beginning of the light period showed nearly all of the radioactivity was incorporated into malate and aspartate. Intermediates of the Calvin cycle were labeled after a 2 minute illumination. At 35C, radioactivity appeared in 3-phosphoglycerate and in malate and aspartate after 10 seconds. Intermediates of the Calvin cycle were labeled after 20 or 20 accorded of appeared in 3-phosphoglycerate and in malate and aspartate after 10 seconds. Intermediates of the Calvin cycle were labeled after 20 or 30 seconds of photosynthesis. Carboxylation of phosphoenol-pyruvate and the Calvin cycle are involved. Possible role of the control of carbon metabolism during induction is discussed. (Jones-Wisconsin) W73-07198

RELATIONSHIPS BETWERN PRIMARY PRODUCTIVITY AND MOSQUITOFISH (GAMBUSIA AFFINIS) PRODUCTION IN LARGE MICROCOSMS, Savannah River Ecology Lab., Aiken, S.C. C. P. Goodyear, C. C. Boyd, and R. J. Beyers. Limnology and Oceanography, Vol 17, No 3, p 445-450, 1972. 1 fig, 1 tab, 25 ref. AEC AT (38-1)-310.

Descriptors: "Fish harvest, "Primary productivity, "Nitrogen, "Trophic level, Laboratory tests, Zooplankton, Bottom sediments, South Carolina, Photosynthesis. *Fish production, Mosquitofish, Identifiers:

Aiken (S.C.).

The microcosm technique was used in studying the The microcosm technique was used in studying the relationships between primary productivity and mosquito fish production. Gambusia affinis were raised in 244-cm diameter pools, fertilized with different amounts of commercial fertilizer to establish various levels of primary productivity, which was measured by both oxygen and pH-carbon dioxide estimates. Mosquitofish were selected for the experiments since they are hardy and survive harsh microcosm environments between 25-36C and pHs 7.5 to 10.3; they also have considera-36C and pHs 7.5 to 10.3; they also have considerable capability for growth and reproduction, reproducing several times during a summer under favorable conditions. Mosquitofish and residues of organic matter accumulated in the pool bottoms were harvested at the end of the experiment and fish production was highly correlated with net and gross primary productivity as measured by both techniques. About 80% of the variation in mosquitofish production was attributed to difmosquitorish production was attributed to dif-ference in gross primary productivity. The fish production was more highly correlated with the amount of organic nitrogen in the residue than with the total amount of residue in each microcosm. Gross photosynthesis measurements appear to be the most correct of the practical indices on which to base judgments of fishing potential. (Jones-Wisconsin) W73-07199

STUDIES ON THE HILL REACTION OF MEM-BRANE FRACMENTS OF BLUE-GREEN AL-GAE. IL. THE REACTION STEPS INAC-TIVATED AT HIGH WATER CONCENTRA-

Tokyo Univ. (Japan). Ocean Research Inst. R. Suzuki, and Y. Fujita. Plant and Cell Physiology, Vol 13, No 33, p 427-436, 1972. 4 fig, 3 tab, 17 ref.

Descriptors: "Cyanophyta, "Biological membranes, "Biochemistry, "Plant physiology, Photosynthesis, Chlorophyll, Fluorescence, Anabaena, Photoactivation, Pigments, Algae. Identifiers: "Photosystem II, "Hill reaction, Anabaena variabilis, Anabaena cylindrica, Anacystis nidulans, Plectonema boryanum, Inactivation.

Hill activity in membrane fragments of two blue-green algae, Anabaena cylindrica and A. variabilis, had been reported stable only when the membrane fragments were kept in high concentrations of car-bohydrate or polyethylene glycol 4000 (PEG). Sta-bilizing effects of added carbohydrate or PEG did not correlate with osmotic pressure of the medium but was closely related to the water concentration. Apparently added carbohydrate or PEG reduced water concentration around the active membrane sites, thus protecting the reaction system from the disorganization. For full stabilization, 1.2 M sucrose or 20% PEG was required in A. cylindrica, while 0.4 M sucrose or 5% PEG was sufficient in A. variabilis, thus the reaction site (s) inactivated while 0.4 M sucrose or 5% PEO was sufficient in A. variabilis, thus the reaction site (s) inactivated at a high water concentration differs in the two prompting examination of the effect of added elec-tron donors on the photosystem II reaction and on the yield of chlorophyll fluorescence with both Anabaena preparations. Inferentially A. variabilis Amount preparations. Interestingly, valuables, inactivation occurs in the reaction system before the site which receives electrons from artificial donors probably including the water oxidation system; in A. cylindrica, besides this site, a site at or near the photochemical system is also blocked. Similar inactivation was observed using Anacystis nidulans and Plectonema boryanum. (Jones-Wisconsin)

OF THE MOVEMENT OF PHOSPHORUS THROUGH THE SALT MARSH CORD GRASS, Georgia Univ., Sapelo Island. Marine Inst. R. J. Reimold.

Limnology and Oceanography, Vol 17, No 4, p 606-611, 1972. 2 fig, 2 tab, 15 ref. AEC ORO-3238.

Descriptors: *Cycling nutrients, *Phosphorus, *Coastal marshes, *Salt marshes, Sediments, Estuaries, Sea water, Tides, Radioactivity techniques, Seasonal, Georgia.

Identifiers: *Duplin Estuary (Ga.), Spartina alter-

Spartina alterniflora plays an important role in phosphorus cycling in the salt marsh ecosystem by removing phosphorus from sediments and releasing it back into the water via bacterial degradation of the dead plant. Pathways for the flux of phosphorus between sediments, Spartina, and water are described. Spartina serves as a nutrient pump and translocates measurable quantities of phosphorus from the slat marsh sediment to the leaves. With tidal inundation, an average of 9.84 mg atom P/m is released in the marsh waters at each tidal cycle. To confirm the amount of total inorganic phosphorus being lost during tidal inundaorganic phosphorus being lost during tidal inunda-tion, harvested plants from square meter quadrats were washed in membrane-filtered estuarine water, the wash water again membrane filtered,

and the dissolved inorganic phosphorus determined. Finally, experiments were conducted to evaluate seasonal uptake of P-32 by Spartina from salt marsh sediments. Sediments were routinely labeled at 1 m depth with radioactive phosphorus with each measurement representing six replicate observations; these experiments were designed to correspond with the six ecological seasons of the year. The role of Spartina in contributing inorganic phosphorus to estuarine and coastal waters points out the need that it remain undisturbed in the highly productive salt marsh ecosystem. (Jones-Wisconsin) W73-07208

ASPECTS RELATING TO EMERGENT VEGETATION DYNAMICS IN A DEEP MARSH, NORTHCENTRAL IOWA, Iowa State Univ., Ames.

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Iowa State Oniv., Ames. G. D. Van Dyke. PhD thesis 1972. 162 p, 15 fig, 13 tab, 134 ref, 4 append. OWRR A-039-IA (1).

Descriptors: *Aquatic plants, *Dynamics, *Marshes, *Iowa, Growth stages, Mapping, Acrial photography, Distribution, Wetlands, Biomass, Systematics, Nutrients, Density, Muskrats, Peat, Water level fluctuations, Management, Successions

Identifiers: *Northcentral Iowa, *Energent vegetation, Big Wall Lake (Iowa).

vegetation, Big Wall Lake (lowa).

Emergent marsh vegetation in Big Wall Lake, Iowa was studied relative to water regime, water quality, sediment, species distribution, species dominance, biomass, energy, and mineral nutrient content. The dominant plants are listed and their habitats and significance described. Stands having single-dominants were sampled at different seasons and calorific values for submerged organs and shoots measured. Levels of nutrient metals were high in submerged organs of all six dominants investigated. Root zone water chemistry was influenced by both fluctuating levels and vegetation; copper and iron tended to increase as water levels dropped, while chloride levels decreased; total alkalinity and hardness increased with lowered water levels but varied considerably between stands; orthophosphate levels were more closely related to stand dominants and other factors than to water levels. The role played by muskrats in transporting vegetative organs may lead to stablishment of new tends (of the heise of krats in transporting vegetative organs may lead to establishment of new stands. On the basis of present vegetation, the lake is best classified as slightly brackish but on the basis of surfacewater nugnty oracisis but on the basis of surfacewater chemistry it is a fresh water marsh. Water chemis-try in the root zone is significantly different from water chemistry at the surface being consistently higher in total alkalinity, hardness, iron, and car-bon dioxide. (Jones-Wisconsin)

MACROBENTHIC COMMUNITIES IN THE COEUR D'ALENE LAKE SYSTEM, Idaho Univ., Moscow.

J. E. Winner.

Master's thesis, July 1972. 41 p, 5 fig, 10 tab, 37 ref. OWRR B-015-IDA (2).

Descriptors: *Systematics, *Benthic fauna, *Biological communities, *Idaho, *Lakes, Invertebrates, Diptera, Oligochaetes, Heavy metals, Sediments, Mine wastes, Zinc, Industrial wastes, Bioindicators, Ecological distribution, Water polution effects, Hydrogen ion concentration, Temperature, Dissolved oxygen. Identifiers: *Coeur d'Alene Lake (Idaho), Organic carbon, Lake Chatcolet (Idaho), Round Lake (Idaho)

The extent of contamination by mine and smelter wastes in the Coeur d'Alen lakes, Idaho was studied by measuring concentrations of five heavy metals in the sediments and studying their possible effects on benthic communities. Zinc concentra-

tions were 627-7320 ppm in Lake Coeur d'Alene and 10-105 ppm in Chatcolet and Round Lakes. Beathic macroinvetebrates were collected and dentified from four depths in four areas of Lake Coeur d'Alene in July and September 1971 and in March 1972 to determine distribution and relative numbers. Chironomid larvae and oligochaetes made up 90% of the 62 taxs of macroinvertebrates identified. The most commonly collected organisms were chironomids in Lake Coeur d'Alene and oligochaetes in Round and Chatcolet Lakes. Macroinvertebrates were most abundant in shallow water where aquatic macrophytes were com-Macroinvertebrates were most abundant in shallow water where aquatic macrophytes were common. Sixty percent of the organisms were found in samples from 2 meters, but wide variation was observed. Distribution of benthic chironomids or oligochaetes did not seem to be substantially affected by 1000-7000 ppm zinc and other metals in the sediments. Southern portion of the lake system contained many macroinvertebrates associated with nutrient-rich waters while the northern portion contained many organisms associated with oligotrophic waters. (Jones-Wisconsin) W73-07210

ALGAE PRODUCTION AND NUTRIENT EN-RICHMENT IN LAKE COEUR D' ALENE, IDAHO, Idaho Univ., Moscow.

J. I. Parker. Master's thesis, May 1972. 39 p. 7 fig, 8 tab, 33 ref. OWRR B-015-IDA (1).

Descriptors: *Eutrophication, *Primary productivity, *Baseline studies, *Nutrients, *Trophic level, Idaho, Light intensity, Phytoplankton, Physicochemical properties, Photosynthesis, Laboratory tests, On-site tests, Phosphates, Nitrates, Alkalinity, Water quality, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Carbon, Solar radiation, Lakes.
Identifiers: *Lake Coeur d'Alene (Idaho).

Identifiers: *Lake Coeur d'Alene (Idaho).

To develop recommendations for pollution control and to serve as a baseline for evaluating enrichment-caused changes in Coeur d'Alene Lake, Idaho carbon fixation rates throughout the lake were assessed by in vitro tests under controlled light and temperature conditions. In situ productivity by algal fixation was measured by C-14 at a control station in open waters. Assessment was made at 12 stations during July-November 1971 of phytoplankton distribution, enriching nutrients (nitrates and phosphates), light intensity, incident solar radiation, pH, dissolved oxygen, specific conductance, carbon available for photosynthesis, and alkalinity. In vitro rates ranged from 10-250 mg/C cu m/4 hr incubation period and in situ rates ranged from .06-6.6 gC/sq m per day. Higher nutrient concentrations were found in the southern areas of the lake apparently from river and stream discharge. Carbon fixation rates were significantly dependent upon diatom and phosphate concentrations; maximum fixation rates were observed where phosphates and diatoms were in highest concentrations. The middle and southern areas produced dense algal growths and macrophytes and appeared to be strongly mesotrophic. Open water of the northern areas appeared oligotrophic with low nutrient concentrations and diatoms. (Jones-Wisconsin) W73-07211

UTILIZATION OF AQUATIC PLANTS IN STEER DIETS: VOLUNTARY INTAKE AND DIGESTIBILITY, Florida Univ., Gainesville.

Master's thesis, 1971. 45 p. 21 tab, 34 ref. OWRR A-017-FLA (3).

Descriptors: *Aquatic weed control, *Aquatic plants, *Cattle, *Feeds, *Digestion, Water hyacinth, Bermudagrass, Proteins, Cellulose, Statistical methods, Nutrients, Eutrophication, Nutrient removal.

Identifiers: *Steers, Aquatic plant utilization, Voluntary intake, Florida elodea, Coastal bermu-dagrass, Pelleted aquatic plants.

dagrass, Pelleted aquatic plants.

Water hyacinths (Eichhornia crassipes), Florida elodea (Hydrilla verticillata), and coastal bermudagrass (Cynodon dactylon) were studied as a dietary supplement for cattle. After processing the aquatic plants their chemical composition was determined and they were included as 33% of organic matter in pelleted diets for yearling steers. The gross chemical composition of water hyacinths and Hydrilla verticillata were similar to land forage although the digestible energy and digestible protein levels were generally lower than that of land forage. Total fecal and urine collections were made. All steers remained apprently healthy and in positive nitrogen balance. On the basis of grams organic matter intake per kg body weight, diet acceptability was higher for diet CB than diet HV and diet HV but not diet WH. Digestible energy intake was larger for diet CB than diet HV and diet WH. Apparent digestibility on utrient in diets WH, HV, and CB respectively were: organic matter 66.0, 70.4 and 72.4; crude protein 51.7, 47.8 and 65.2; cellulose 31.3, 54.1 and 37.3, Estimated digestibility of organic matter and protein of coastal bermudagrass, Hydrilla v. and water hyacinth respectively were: organic matter 37.7, 29.2 and 17.1; crude protein 40.7, 0 and 0. (Jones-Wisconsin)

TRITIUM INCORPORATION IN THE METABOLISM OF CHLORELLA PYRE-

California Univ., Berkeley. Lawrence Berkeley

T. Kanazawa, K. Kanazawa, and J. A. Bassham. Environmental Science and Technology, Vol 6, No 7, p 638-642, 1972. 1 fig, 2 tab, 8 ref.

Descriptors: *Algae, *Tritium, *Absorption, *Metabolism, *Chlorella, Biochemistry, Isotopes, Analytical techniques, Radioactivity, Radiochemical analysis, Hydrogen.
Identifiers: *Chlorella pyrenoidosa, Isotopic dis-

crimination.

Considering possibilities for the release of tritium into the environment, detailed knowledge of the biochemical fate of tritium taken into living organisms is desirable; in freshwaters incorporation would be through unicellular algae. Tritium incorporation into a large aumber of biochemical compounds in photosynthesizing Chlorella pyrenoidosa was measured, showing overall incorporation at about 70%. Discrimination against tritium incorporation into specific compounds varies widely from one compound to another. In contrast to the incorporation of carbon, which is taken up mostly by a single carboxylation in the reductive pentose phosphate cycle in C. pyrenoidosa, hydrogen is incorporated at many points along the biosynthetic pathways. The highest tritium incorporation was found in compounds of the tricarboxylic acid cycle (malate, citrate, glutamate, glutamine, aspartate, and asparagine), suggesting that once incorporated, tritium is preferentially retained during oxidative reactions. This conclusion may have some implications for other organisms which are not autotrophic and therefore depend on oxidative metabolism of food. (Jones-Wisconsin)

BOTTOM FAUNA AND COOLING WATER DISCHARGES IN A BASIN OF LAKE MALAREN, Uppsala Univ. (Sweden). Inst. of Zoology. T. Wiederholm.

Rep Inst Freshwater Res Drottningholm. 51. p 197-214. 1971. Illus.

Descriptors: *Benthic fauna, *Discharge (Water).

Group 5C-Effects of Pollution

Identifiers: Basin, Branchiura sowerbyi, Chironomids, Cooling water, *Lake Malaren, Oligochaetes, Sweden, Lakes, *Thermal pollution.

The bottom fauna of a basin of Lake Malaren was The bottom fauna of a basin of Lake Malaren was investigated, especially with regard to the effects of cooling water discharges. The composition of the total fauna reflects a pollution gradient from the town of Vasteras towards the main part of Lake Malaren. A larger biomass is noted near the warm water discharges, principally because of higher abundance of oligochaetes. The warm higher abundance of oligochaetes. The warm water tubificid Branchiura sowerbyi was found near an effluent. Three chironomid species new to Sweden are recorded. It is suggested that the composition of the chironomid fauna reflects a temperature influence in the whole basin.—Copyright 1972, Biological Abstracts, Inc. W73-07214.

DRIFT AND PRODUCTION IN TWO AQUATIC

INSECTS IN A MOUNTAIN STREAM, North Texas State Univ., Denton. Dept. of Biological Sciences; and Utah Cooperative Fishery Unit,

Logan. W. D. Pearson, and R. H. Kramer. Ecological Monographs, Vol 42, No 3, p 365-385, 1972. 14 fig, 14 tab, 33 ref.

Descriptors: *Drifting (Aquatic), *Productivity, *Aquatic insects, Migration, *Streams, Aquatic populations, Environment, Correlation analysis, Caddisflies, Mayflies, Density, Biomass, Benthic fauna, Utah, Upstream. Identifiers: Oligophlebodes sigma, Baetis bicaudatus, Logan River (Utah), Temple Fork (Utah),

Some relationships between drift rate, population density, production rate, key environmental factors, and movements within two species of drifting invertebrates were clarified by studying caddisfly and mayfly populations in Temple Fork of the Logan River, Utah. Benthic invertebrates were collected every 28 days at four stations from October 1967 to September 1969; drift invertebrates were collected every 14 days at three stations during the same period. During June-September a day and a night drift sample were collected every other ing the same period. During June-September a day and a night drift sample were collected every other day. Drift rates of Oligophlebodes sigma larvae were greatest when biomass in the benthos and production were greatest. Drift rates of 0. sigma and Baetes bicaudatus were not related directly to density as expressed as numbers/area in the benthos but were correlated positively and significantly with density during June-September for both 0. sigma larvae and B. bicaudatus nymphs. Adult 0. sigma (but not B. bicaudatus) undertook Adult 0. sigma (but not B. bicaudatus) undertook upstream migration of about 2-3 km. The advantage of the upstream flight may be that reproductive products are stored in areas relatively safe from effects of anchor ice during winter nd floods in late winter and early spring. (Jones-W73.07215

FES-CONCRETIONS IN THE LAKE OF CON-

STANCE, (IN GERMAN),
Staatl Institut fuer Seculorschung und Seenbewirtschaftung, Langenargen (West Germany).

G. Wagner. Int Rev Gesamten Hydrobiol. Vol 56 No 2 p 265-272. 1971. (English summary). Identifiers: Concretions, *Lake Constance, Ger-many, Lakes, *Iron compounds, *Sulfates.

Distribution and chemical composition of FeS concretions in the sediment of Lake Constance (Bodensee) are described. The transfer of the mouth of the River Rhein in 1900 and the eutrophication of the lake during the last 20 yr are considered as possible reasons for the forming of the concretions.—Copyright 1972, Biological AbREGULATION OF BRANCHED CHAIN AMINO ACID TRANSAMINASE FORMATION DURING GROWTH OF PSEUDOMONAS FLUORESCENS

UK-1, Turku Univ. (Finland). Inst. of Biochemistry. M. Puukka, H. Lonnberg, and V. Nurmikko. Acta Chemica Scandinavica, Vol 26, No 3, p 1271-1273, 1972. 1 fig., 2 tab, 16 ref.

Descriptors: *Cytological studies, *Amino acids, *Biochemistry, Enzymes, Pseudomonas, Kinetics, Carbon, Bacteria. Identifiers: *Pseudomonas fluorescens.

Branched chain amino acid transaminase catalyses the terminal reaction in the biosynthesis of branched chain amino acids in several bacteria. In Pseudomonas fluorescens such a transaminase is required in biosynthetic as well as catabolic pathways. Culture conditions and harvestign of Pseudomonas fluorescens strain UK-1 are given. Kinetics of induction of branched chain amino Branched chain amino acid transas ninase catalyses Kinetics of induction of branched chain amino acid transaminase is shown in response to different carbon sources. Isoleucine and 2-oxoisovalerate were the most powerful inducers among the carbon sources studied. Data show that branched chain amino acid transaminase is subject to regulatory control and a brief survey of enzyme levels in cells grown on a number of carbon sources suggests that the branched chain amino acid transaminase is induced by branched chain amino acid transaminase is induced by branched chain amino acid transaminase by isobutyrate, 3-hydroxyisobutyrate, or proprionate. Branched chain amino acid transaminase exhibits characteristics of several bacterial catabolic enzymes. It is inducible and intransaminase exhibits characteristics of several bacterial catabolic enzymes. It is inducible and induction begins at the same time as cell multiplication and continues throughout exponential phase of growth. As far as known, it has not previously been observed that branched chain amino acids increase activity of branched chain amino acid transaminase in bacteria. (Jones-Wisconsin)

OXYGEN BALANCE OF STREAMS. Water Pollution Research Lab., Stevenage (England).

In: Pollution of Fresh Waters, report of the Director of Water Pollution Research, p 23-25, 1971. 2 fig, 1 tab.

Descriptors: *Oxygen, *Streams, *Biochemical oxygen demand, Velocity, Effluents, Organic matter, Suspended solids, Nitrogen, Dissolved oxygen, Mud, Cores, Settling velocity, Identifiers: Cambridge (England), Deposited

solids.

Effect of water velocity on the deposition of organic solids from suspension, of changes in the nature of the settled solids, and of the oxygen demand they exert, was evaluated using experimental channels at the City of Cambridge (England) sewage treatment works and the effluent from the biological filtration plant. Respiratory demand of the deposited material was estimated from measurements of the concentration of dissolved oxygen made at each end of the channel during a period of 12 h overnight, taking into account the exchange of oxygen at the air/water interface using calculated values of the exchange coefficient corresponding to the velocity and depth of the water in the channel. Rates of oxygen demand of the benthic deposit are similar to those obtained from natural river systems. Mud cores taken during these periods and their mean oxygen demand of was 5.8 goxygen ag mat 15C with 7.0 mg/l oxygen in the overlying water. The estimated oxygen demand of the material excumplated in the channel. in the overlying water. The estimated oxygen de-mand of the material accumulated in the channel ancreased with velocity. Test results suggest that in rivers having velocities at which sewage effluent solids are likely to be deposited, benthal respira-tion is likely to be underestimated from the respiration of mud cores measured under static conditions. (Auen-Wisconsin) W73.07216 increased with velocity. Test results suggest that in

CHLOROPHYLL AND THE MARGALEF PIG. MENT RATION IN A MOUNTAIN LAKE, Bradley Univ., Peoria, Ill. Dept. of Biology. B. J. Mathis.

nerican Midland Naturalist, Vol 88, No 1, p 232-235, 1972, 2 tab, 13 ref.

Descriptors: "Biological communities, "Chlorophyll, "Pigments, Trophic level, Succession, Plankton, Virginis. Identifiers: Mountain Lake (Virginia), Pigment diversity index, Margalef pigment ratio.

Before the value of Margalef's pigment diversity index in estimating successional stages in aquatic ecosystems can be applied, more comparative studies on natural ecosystems should be conducted. According to Margalef the 'yellow-green' pigment ratio increases, in general, as succession ad-vances--it would be highest in older, more mature vances—it would be highest in older, more mature ecosystems and lowest in younger, immature ecosystems. In the study of extremely clear Mountain Lake, Giles County, Virginia mean chlorophyll-a concentration was 2.71 mg/c um, on which basis the lake appears primarily oligotrophic with secondard (morphometric) eutrophy. The Margalef pigment ration was rather erratic and ranged from 3.43 to 7.07, thus these rather high values would seem to suggest an old and stable ecosystem. The low chlorophyll-a concentration in the lake is probably due to low nutrient levels since; it is located in a rather remete and wooded since it is protonly due to low natural neves since it is located in a rather remote and wooded area. The Margalef pigment ration obviously should be used with care in assessing degree of succession in aquatic ecosystems. (Auen-Wiscon-W73-07220

REFLECTANCE AND TRANSMITTANCE CHARACTERISTICS OF SELECTED GREEN AND BLUE-GREEN UNIALAGAE, WISCORDIN UNIV., Madison. Dept. of Civil En-

gineering. L. C. Gramms, and W. C. Boyle. Water Research, Vol 6, No 12, p 1443-1444, 1972. 8 fig, 3 tab, 19 ref.

Descriptors: "Remote sensing, "Analytical techniques, "Reflectance, "Transmissivity, "Algae, Chlorophyta, Cyanophyta, Chlorella, Anabaena, Spectrophotometry, Pigments. Identifiers: Spectral bands, Selenastrum, Micro-

The relectance and transmittance characteristics of two green algae, Selenastrum and Chlorella, and two blue-green algae, Microcystis and Anabaena, were evaluated. It was found possible Anabaena, were evaluated. It was round possions to difference qualitatively blue-green unialgae from green unialgae by using the ratio of the reflectances at 625 and 650 nm. Specific calibrareflectances at 625 and 650 nm. Specific calibration curves must be developed in the normal range of concentration expected for each species, because of the unique spectral reflectance properties exhibited by each alga; the unique properties may be attributed to the morphological and chemical makeup of each algal species. Background turbidity must also be considered. Turbidity may change the effective column depth of the algae in change the effective column depth of the algae in relationship to the volume spectral reflectance. Chlorophyll-a loss in the test algae resulted from removal of phosphorus from the growth media which was accompanied by a substantial reflectance increase in the spectral bands, associated with chlorophyll-a and other algal pigment absorptions. Spectral reflectance techniques to differentiate between algal groups and to quan-titatively assess algal concentrations in surface waters are feasible and practical. Cognizance of the influence of physical and chemical charac-teristics of the surface waters and the physiolog-cal state of the algae is important. (Jones-Wiscon-

REVIEW PAPER: ESTUARINE WATER QUALI-TY MODELS, Tracor, Inc., Austin, Tex. W. H. Espey, Jr., and G. H. Ward, Jr. Water Research, Vol 6, No 10, p 1117-1131, 1972. 7 fig. 21 ref.

Descriptors: "Reviews, "Estuaries, "Water quali-ty, "Model studies, Analog models, Water pollu-tion effects, Water pollution control, Mathemati-cal models, Simulation analysis, Statistical models.

models. Identifiers: Electrical analog models, Physical hydraulic models, Physical processes model, Nucces Estuary (Texas), Case studies, Delaware

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Major conclusions of the Ward and Espey (See W72-04555) appraisal of estuarine modeling are reviewed. While modeling of the hydrodynamic transport of a constituent in an estuary is much further advanced than the modeling of its reaction transport of a constituent in an estuary is much further advanced than the modeling of its reaction kinetics, the most unsatisfactory aspect of present water quality models is the specification of the source and sink terms. Many of the physicochemical processes affecting the concentration of parameters lack adequate formulation as not only are the coefficients unknown, but the forms of the reactions are poorly established. The greatest weakness of present hydrodynamic models is the treatment of the eddy diffusivities and dispersion coefficients, particularly within the salinity intrusion region. The effects of the estuarine environment and physiography on the dispersion are virtually unknown, severly limiting predictive capabilities of the model. Reactions and reaction rates which in the short term appear to be insignificant may be controlling in the long run. The best experimental approach to modeling appears to be the use of largescale environmental simulators closely coupled with prototype verification of pathways and reservoirs. Conclusions are advanced in the context of identifying deficiencies in present modeling techniques and formulating recommendations for researching. Case studies of the Texas' Nueces Estuary and the Delaware Estuary are included. (Auen-Wisconsin)

PRODUCTION OF BASIC COMMUNITIES IN PONDS WITH MINERAL FERTILIZATION PONDS-FERTILIZATION AND DESCRIPTION, Polish Academy of Sciences, Krakow. Zaklad Biologii Wod. S. Wrobel.

Polskie archiwum Hydrobiologii, Vol 18, No 2, p 167-173, 1971. 2 fig, 19 ref.

Descriptors: "Fertilization, "Ponds, "Productivity, "Biological communities, Trophic level, Phosphorus, Nitrogen, Phytoplankton, Carp, Climatic zones, Chemical properties, Organic matter, Fish farming, Eutrophication, Chlorophyta, algae. Identifiers: Golysz (Poland).

Researches on pond fertilization in Experimental Fishery Farms at Golysz (Cieszn) Poland, con-cerned influence of fertilizers on chemical contents of water, on quality and quantity of plant and animal communities, and on fish production. Apanimal communities, and on fish production. Ap-plication of a phosphorus and nitrogen combina-tion induced a more uniform phytoplankton development consisting mainly of small Chlorophyta while ponds fertilized with phosphorus only produced periodic Cyanophyta blooms. In the P and N fertilized ponds, primary production of phytoplankton was 3 to 4 times greater than in the unfertilized. Fish production greater than in the unfertilized. Fish production was also 3 to 4 times greater than in the unfertilized ponds and twice as great as those fertilized with phosphates alone. Carp production averaged 2.75% of primary production of phytoplankton. A comparison of fertilization in various climatic zones indicates increasing effectiveness of N and P with increasing geographical latitudes; nitrogen fertilization proved to be unnecessary in the tropics while in the subtropical climates it was found that P and N had a positive influence on fish production in spring and autumn while its effects were no better in summer than those of P alone. Investigations of ponds in which various factors can be controlled at will provided important data for an explanation of the causes of eutrophication and for prevention methods. (Jones-Wisconsin) W73-07225

FACT AND FOAM IN THE ROW OVER PHOSPHATES, W. S. Rukeyser. Fortune, p 71-73, 166, 168, 170, January 1972. 2

Descriptors: "Phosphates, "Aquatic environment, "Detergents, Public health, Federal government, Economics, Surfactants, Decision making, Attitudes, Eutrophication, Limiting factors, Marketing, Sewage treatment, Nitrilotriacetic acid. Identifiers: Soap and detergent industry, Phosphate removal, Formulations.

Phosphate removal, Formulations.

The history of phosphate in detergents—substitutes, industry's dilemna, public health, phosphorus removal from sewage, chemistry of detergents, and complexity of lake biology—is extensively discussed. Were it possible to change detergent formulas close to 50% of all phosphorus input into lakes might be eliminated as it is chiefly responsible for eutrophication and is considered the most controllable of nutrients. NTA use had to be discontinued until further research could be pursued due to its possibly detrimental effects on public health. The best course at present is for localities with algal problems to build sewage treatment facilities capable of removing phosphates. New treatment techniques make it possible to remove nearly all phosphorus from sewage, whatever its source, with only relatively minor additions to existing treatment plants. Removal of phosphorus from sewage locally might be more economically feasible and more effective than wholesale replacement of phosphate in detergents. Perhaps manufacturers should be required to indicate on their cartons that a fraction of the usually recommended one-cup dosage can give acceptable results in many localities. To change detergent ingredients to cure ailing lakes may be considered society's understandable but futile hunt. (Jones-Wisconsin)

MICROBIOLOGICAL PROCESSES IN LATVI-AN LAKES, (IN RUSSIAN), V. I. Romanenko, S. I. Kuznetsov, and A. S.

Daukshta.
Tr Inst Biol Vnutr Vod Akad Nauk SSSR. 21.24.

31-42. 1971. Identifiers: *Bacteria, *Lakes, Latvia, Microbiology, *Photosynthesis, Phyto plankton, USSR, Oxidation-reduction potential.

USSR, Oxidation-reduction potential.

In small, eutrophic lakes, photosynthesis reached 9.8-11.7 g C/m2/day in June. Maximum photosynthesis occurred at a depth of 10-20 cm (36 mg C/l/day). The amount of bacteria was equal to 1.0-2.6. 1,000,000/ml and daily production of bacterial biomass consisted of 0.5-1.2 mg C/l. The redox potential of the mud was RH2 ± 13-15. In oligotrophic lakes, where the water was transparent at 7 m (according to Secchi's disk readings), phytoplankton photosynthesis did not surpass 0.12-0.13 g C/m2/day; i.e., it was 90 times less than in the eutrophic lakes. The amount of bacteria was also lower (0.4 · 1,000,000/ml of water) and daily production of the bacterial biomass did not surpass 0.017 mg C/l. The redox potential of the mud was high (RH2 ± 18-23). In the dystrophic Lake Melnezeps, whose water had a pH of 4.1, photosynthesis was slow and there was a small amount of bacteria (0.38 · 1,000,000/ml of water) of low activity. The redox potential in the mud was low (RH2 ± 9-13) because of the presence of free

H2S. Mezotrophic lakes were between the eutrophic and oligotrophic lakes. Heterotrophic assimilation of CO2 was the best indicator of microflora activity. In oligotrophic lakes, it was equal to 1-2.2 micrograms C (C)2/1/day, and in eutrophic, 29-71 micrograms/1/day.—Copyright 1972, Biological Abstracts, Inc.
W73-07228

GRADATION OF BIOACTIVITY IN WATER MODELS ARRANGED IN SERIES, (IN GERMAN), Technische Universitaet, Dresden (East Germany). Bereich Hydrobiol. D. Uhlmann.

D. Uhlmann.
Limnologica. Vol 8, No 2, p 421-452. 1971. Illus.
English summary.
Identifiers: Ankistrodesmus-falcatus, Bacteria,
*Bioactivity, Biomass, Chlamydomonas-variabilis, Daphnia-magna, Gradation, Models,
*Phytoplankton, Water pollution effects.

bilis. Daphnia-magna, Gradation, Models,
Phytoplankton, Water pollution effects.

The successive gradation of autotrophic and heterotrophic activity between storage basins arranged in series was investigated by semicontinuous laboratory models. Each series consisted of 5 units, providing an overall detention time of 50 days. The clear ('mixotrophic') series were illuminated 16 hr/day, the dark ('heterotrophic') units were exposed to complete darkness. The experiments were performed at 20 deg C in a thermostat chamber and operated on a modified fill-and-draw-basis (addition of synthetic sewage into the first unit). An extremely high BOD (biochemical oxygen demand) load of the first unit (185 mg/1/day) did not prevent massive growth of phytoplankton (Chlamydomonas variabilis, Ankistrodesmus falcatus). In the last units the BOD was very low, and the total number of bacteria in some cases was less than 1% of the number of the first unit. This mainly was the result of filtering activity of Daphnia magna. In the illuminated series, however, the concentration of biomass in some cases increased in the last 3 units, corresponding to a chlorophyll "a' content up to 15 mg/1. There were remarkable differences between illuminated and dark series with respect to incorporation or release of dissolved N and P compounds. The P content of the bottom sediment in some cases amounted to more than 10% of the dry weight, in spite of anaerobic conditions in the water layer. The concentration not only of biomass, but also of substrate decreased from 1-5, but the specific activity of suspended bacteria (mg O2 consumed/mg dry weight of biomass/day) increased. The equations for computation of growth rate and of yield developed by Monod were applied to the mixed populations and mixed substrates of the series. The 'overall growth rate' microns of the orpanic substrate were converted into biomass of bacteria.—Copyright 1972, Biological Abstracts, Inc. Inc. W73-07272

EXPERIMENTAL VALIDATION OF PERMISSI-BLE CONCENTRATION OF DIANATE AND 2.3.6-TRICHLOROBENZOIC ACID IN WATER

Kiev Research Inst. of General Communal Hye (USSR).

giene (USSR).

D. I. Golovan.
Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 14-18, October-December, 1970, 2 fig, 1 tab, 8 ref. Trans from Gigiena i Sanitariya.

Descriptors: "Herbicides, "Water quality, "Water quality control, Water pollution effects, Organoleptic properties, Organic compounds, "Public health. Identifiers: "USSR, "Dianate, 2,3,6-Trichlorobenzoic acid, Banvel D.

Group 5C-Effects of Pollution

Dianate and 2,3,6-Trichlorobenzoic acid were new Soviet organochloride herbicides belonging to the group of chlorinated benzoic acids. The affect of 2,3,6-TCBA on the organoleptic properties of water was studied by determining its olfactory and gustatory thresholds. The threshold concentrations with respect to the effect on the sanitary regime of water bodies are 100 mg 2,3,6-TCBA per liter and 150 mg dianate per liter. Further investigations determines the possible detrimental effects of 2,3,6-TCBA and dianate on health as a result of consumption in water. The results revealed that the preparations affected the activity of redox enzymes as is characteristic of all organochloride compounds. A table is included with the results of the experiments. Because of these results, the maximum permissible concentration in a water body of 2,3,6-TCBA was set at a level of 1.0 mg/1 and that of dianate at 15.0 mg/1. (Smith-Texas) Texas W73-07281

HYGIENIC STANDARDS FOR LEAD AND CYANIDE SIMULTANEOUSLY PRESENT IN WATER BODIES,

Research Inst. of Hygiene, Sofia (Bulgaria).

Ts. S. Vodichenska. Available from the National Technical Informa Avausois from the National Technical informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 90-95, October-December, 1970. 2 tab, 15 ref. Trans from Gigiena

Descriptors: *Lead, *Organoleptic properties, *Biochemical oxygen demand, *Toxicity, Public health, Water pollution effects, Water quality, Water supply, Industrial wastes.
Identifiers: *Cyanides, *USSR.

Since the composition of industrial effluents is very complex and a water body can be polluted by several substances simultaneously, the problem of combined effects and hygienic standards for comcombined effects and hygienic standards for combinations of health hazards necessitates study. Therefore, experimental studies were undertaken to determine the combined effects of lead and cyanide. The effect of the lead plus cyanide combination in concentrations equal to .05 mg/l, 0.1 mg/l and 0.5 mg/l on the overall sanitary regime of water was investigated by studying the biochemical oxygen demand. Toxicity experiments were also conducted on warm blooded animals in two long term tests. Lead and cyanides in water concentrations equal to 0.05 mg/l, and 0.1 mg/l did not affect the BOD while 0.5 mg/l inhibited the BOD to the extent of 28 to 32%. The results of the long term experiments show that the complex cyato the extent of 28 to 32%. The results of the long term experiments show that the complex cyanide lead combination primarily affects the nervous system and tissue respiration. Further study has shown that the combined effect of lead and cyanides obeys the law of summation. (Smith-Texas) W73-07282

FLUORINE IN DRINKING WATERS OF THE KHARKOV REGION, Regional Sanitary-Epidemiological Center, Kharkov (USSR) For primary bibliographic entry see Field 05B. W73-07283

HYGIENIC EVALUATION OF THE MINERAL COMPOSITION OF DRINKING WATER OB-TAINED BY PARTIAL DESALINATION, Institute of General and Municipal Hygiene, Moscow (USSR). For primary bibliographic entry see Field 03A. W73-07285

HYGIENIC STANDARDS FOR BISMUTH IN WATER BODIES, Institut Gigieny Truda i Profzabolevanii, Sverdovsk (USSR). For primary bibliographic entry see Field 05B.

W73-07287

ON THE PHYTOSESTON OF THE EUTROPHIC TISZA: II. THE QUESTION OF THE INDICATOR ALGAE FOR THE EUTROPHIC CONDI-TIONS OF THE RIVERS,
Damjanich Muzeum, Szolnok (Hungary). Laboram Tisza-Forsch.

G. Uherkovich.
Tiscia. 6 p. 19-24, 1970/1971.
Identifiers: Actinastrum hantzachii, Algae, Ankistrodesumus angustus, Cyclotella, Diatoms, Didymocystis tuberculata, Eutrophic condition, Phytoseston, "Eutrophication, Indicators, Melosira granulata var angustissima, Nitzschia acicularis, Nitzschia palea, Planctomyces bekefii, Rivers, Scenedesmus acuminatus, Scenedesmus opoliensis, Stephanodiscus dubius, Synedra acus, Synedra nitzschia actinastroides, "Tisza River.

Methods and problems of determining the degree of eutrophication in flowing waters are discussed. From analyses of 16 phytoseston communities from the Tisza river, it was determined that Cyclotella spp., Nitzschia acicularis, Melosira granulata var. angustissima, Stephanodiscus duius, Nitzschia palea, Ankistrodesmus angustus, Scenedesmus opoliensis, S. acuminatus and Planctomyces bekefii are important indicators of the degree of eutrophication. To a lesser degree, other diatoms and green algae have indicator value. The full indicator value of Synedra acus, S. (Nitzschia) actinastroides and Actinastrum hantzschii is limited by special conditions of the flowing water, i.e., turbulence. Didymocystis spp., especially D. tuberculata, are much more widely distributed in eutrophic waters than previously thought.—Copyright 1972, Biological Abstracts, Inc.

HYGIENIC EVALUATION OF SANITARY MEASURES FOR THE LUGAN AND OLK-HOVAYA RIVERS IN THE VOROSHILOV-GRAD AREA, Municipal Sanitary-Epidemiological Center, Voroshilovgrad (USSR).
For primary bibliographic entry see Field 05B.
W73-07293

TOXICOLOGICAL CHARACTERISTICS OF PHATHALOPHOS AND ITS PERMISSIBLE LEVEL IN WATER BODIES, Vsesoyuznyi Nauchno-Issledovatelskii Institut Gi-gieni i Toksikologii Pestitsidov, Kiev (USSR). For primary ibbliographic entry see Field 05B. W73-07295

SANITARY PROTECTION OF WATER BODIES AGAINST POLLUTION BY EFFLUENTS FROM THE MANUFACTURE OF FIBERGLASS-REI-NFORCED PLASTICS, Kiev Research Inst. of General Communal Hy-

e (USSR). K. F. Meleshchenko, A. A. Maslenko, N. V.

K. F. Meleshchenko, A. A. Masienko, N. V. Mironets, and A. A. Lur'e. Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 10-12, p 416-419, October-December, 1970. 5 ref. Trans from Gigiena i

Descriptors: *Plastics, *Industrial Wastes, *Chemical wastes, Water pollution sources, *Organoleptic properties, Water properties, Pollutants, Biological treatment, *Oxygen demand, Toxicity, Laboratory tests, Domestic wastes, Waste water treatment, Effluents. Identifiers: *USSR, *Fiberglass.

The composition of effluents from factories manu facturing fiberglass reinforced plastics has not been studied and the conditions for their discharge into open water bodies have not been determined. Effects on the sanitary regime of water bodies were investigated in 8 series of experiments using river and tap water with effluents being diluted 1 to 150 to 1 to 2,000. The conditions for the discharge of effluents and their possible biological treatment were investigated by determining the oxygen demand rate constant and this was found to be similar to that for pollution with domestic effluents. Pathomorphiological studies of the internal organs of animals subjected to long term poisoning with effluents diluted to 1 to 1,000 revealed regenerative and necrotic alterations in the gastro-intestinal tract. No marked alterations were discovered in the internal organs of animals treated with effluents diluted 1:1,500 and 1:2,000. Therefore, it may be concluded that the population can be safeguarded against injury if the effluents are diluted 1:1,500 in the water body. Furthermore, effective treatment is possible together with domestic effluents in biological installations, but this subject calls for special studies. (Smith-Texas) W73-07296 Effects on the sanitary regime of water bodies

EFFECT OF A MIXTURE OF RADIOACTIVE ISOTOPES ON THE SANITARY REGIME OF WATER BODIES, V. N. Gus'koba, A. N. Brugina, and V. M.

Kupriyanova. Available from the National Technical Informa Avainose from the National Technica informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 10-12, p 430-431, October-December, 1970. Trans from Gigiena i Sanitariya.

Descriptors: *Radioisotopes, *Radioactivity, Radioactivity effects, Pollutants, *Oxygen demand, Nitrification, Ammonium compounds, Calcium compounds, Laboratory tests, Microorganisms, Water pollution control.

Libentifiers: *USSR, *Radioactive contaminants.

Experiments were conducted on water with a total mineral content of the order of 500 mg/l including some 300 mg/l of calcium salts. A concentration of the radioisotopes of 10 to the minus 3rd power curie/l inhibited not only the development of saprophytic microflora but also inhibited the oxygen demand. Nitrification experiments on the synthetic media revealed that the nitrification of ammonium compounds was not affect by the radioactive pollutants in concentrations of 10 to the minus 3rd power curies/l and even a concentration of 10 to the curies/1 and even a concentration of 10 to the minus 3rd power curies/1 did not inhibit the first phase of nitrification. The second phase likewise proved resistant to radioactive contamir (Smith-Texas)

INDUSTRIAL POLLUTANTS IN WATER BODIES. For primary bibliographic entry see Field 05B.

PARAPELLIVE ON THE PROBLEM OF CAR-CINOGENIC POLLUTION IN WATER BODIES, Institut Eksperimentalnoi i Klinicheskoi On-kologii, Moscow (USSR). For primary bibliographic entry see Field 05B. W73-07305 PERSPECTIVE ON THE PROBLEM OF CAR-

ON THE USE OF SODIUM BICARBONATE WATERS AS DRINKING WATER, Novosibirsk Public Health Research Inst. (USSR). I. A. Budeev, E. A. Strusevich, T. I. Ezrokh, and B. Yu. Ekshtat.

Available from the National Technical Informa-tion Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 358-360, July-Sep-tember, 1970. 1 tab, 6 ref. Trans from Gigiena i

Descriptors: "Water supply, "Potable water, "Groundwater, "Organoleptic properties, Aquifers, Bicarbonates, Alkalinity, Hardness (Water), Water quality, Water quility control. identifiers: USSR, "Siberia (Western).

Aquifers occur extensively in West Siberia in Upper Cretaceous strata. A characteristic feature of the water in these aquifers is a considerable amount of sodium ions amounting to 350 mg/l on the average and bicarbonate ions 1000 mg/l or more with a total hardness of .2 to 1.3 meg/l. An inestigation was conducted in view of the chemical composition of the water, complaints about its unsatisfactory taste, and the absence of reports concerning its effect on humans. On the basis of evidence from hospital reports and interviews with subjects using the water, it was concluded that sodium bicarbonate waters with an alkalinity of 10 to 16 meg/l and a total hardness of 0.3 to 1.3 meg/l are organoleptically inferior, they may affect certain physiological functions, and their use as drinking water is undesirable. (Smith-Texas)

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HYGIENIC EVALUATION OF AMYL, PRIMARY AND SECONDARY OCTYL ALCOHOLS IN RELATION TO THEIR STANDARDS IN

WATER BODIES, Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Environmental Hygiene A. A. Korolev, G. N. Krasovskii, and S. P.

A.A. Korolev, C. N. Krasovskii, and S. P. Varshavskaya.
Available from the National Technical Information Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 453-455, July-September, 1970. 1 tab, 6 ref. Trans from Gigiena i Sanitariya.

Descriptors: *Alcohols, *Organoleptic properties, Analytical techniques, *Toxicity, Laboratory tests, Aqueous solutions, Water pollution, Water pollution control, Water quality, Pollution abate-ment, Water pollution effects. Identifiers: *USSR, *Maximum permissible con-

This investigation was prompted by the absence of maximum permissive concentrations for amyl and octyl alcohols in open water bodies. A direct analytical method was used to study the stability of aqueous solutions of the alcohols and all three alcohols were found to be of low stability. Toxicity acohots were found to be of low stability. Toxicity experiments were also conducted for certain laboratory animals. On the basis of organoleptic criterion, the maximum permissive concentration of primary and secondary octyl alcohols should be set at 0.05 mg/l and that of amyl alcohol at 1.3 mg/l. (Smith-Texas)

W73-07313

ENVIRONMENTAL GEOCHEMISTRY IN HEALTH AND DISEASE, For primary bibliographic entry see Field 05B. W73-07346

THE MEASUREMENT OF PLANKTONIC HETEROTROPHY AS AN INDICATOR OF EUTROPHICATION, Wayne State Univ., Detroit, Mich. Dept. of Biolo-

R. Monheimer. R. Monacimer. Available from the National Technical Informa-tion Service as PB-218 708, \$3.00 in paper copy, \$9.95 in microfich. Institute of Water Research, Michigan State University, Project Completion Report, February 1973, 20 p, 3 fig, 3 tab, 12 ref. OWRR A-066-MICH (1). 14-31-0001-3522.

Descriptors: Limnology, Primary productivity, Sulfur, Carbon, Photosynthesis, *Plankton, Eutrophication, Organic matter, *Michigan, Analytical techniques, Pollution identification.

Identifiers: *Lake St. Clair (Mich). Heterotrophy.

The object was to develop a method by which planktonic heterotrophy could be measured. The technique ultimately arrived at was the measurement of sulfate (35504) uptake in a manner similar to the carbon-14 technique for measuring primary production is obtained. This study indicates that present methods underestimate planktonic production by from 25% to 400% or more.

CROP RESPONSE TO EXCESSIVE ZINC FER-TILIZATION OF ALKALINE SOIL, Agricultural Research Service, Prosser, Wash. For primary bibliographic entry see Field 03F. W73-07445

WATER POLLUTION BY OH... Institute of Petroleum, London (England). For primary bibliographic entry see Field 05G. W73-07464

FECUNDITY OF FISH IN THE TAIL BAY OF THE V. I. LENIN HYDROELECTRIC POWER STATION (IN RUSSIAN), V. M. Chikova.

Tr Inst Biol Vnutr Vod Akad Nauk SSSR. 21. 14.

222-233. 1971.
Identifiers: *Fish reproduction, *Electric power-plants, Bream, *Fecundity, Fish, Perch, Pike, USSR.

Some characteristics of reproduction in 18 spp. of some characteristics of reproduction in 18 spp. of habitation are considered. In species such as bream and roach for which conditions deteriorated after regulation of the Volga run-off in the area of the Volga Hydroelectric Power Station, the fecundity decreased. Improvement in conditions for fish such as a literature of the Volga run-off in the second of the Volga run-off in the second of the Volga run-off in the second of the Volga run-off in the second of the Volga run-off in the second of the Volga run-off in the second of the Volga run-off in the volga run-off in t such as pike perch and perch caused an increase in fecundity. Due to unfavorable reproductive condi-tions in the tail bay of the hydroelectric power station a substantial portion of the females in many species remained with unshed roe.—Copyright 1972, Biological Abstracts, Inc. W73-07473

THE EFFECTS OF THE DISCHARGE OF SECONDARILY TREATED SEWAGE EFFLUENT INTO THE EVERGLADES ECOSYSTEM. Miami Univ., Fla.

Available from the National Technical Informa-tion Service as N71-29235, \$3.00 in paper copy, \$0.95 in microfiche. Sea Grant Special Bulletin No. 6, February 1972. N. Chitty and C. W. Davis, edi-tors. 123p, 21 fig, 3 tab, 67 ref.

Descriptors: *Waste water treatment, *Water treatment, *Water reuse, *Recycling, Water supply, Ecosystems, Ecology, Waste disposal, Sewage disposal, Water resources, Water pollution control, Water quality control, Watersheds, Florida, *Sewage treatment. Identifiers: *Florida Everglades.

Consideration of recycling treated sewage into the Florida Everglades watershed has been prompted by South Florida's water supply crisis, and the continuing environmental degradation by present sewage treatment methods. The biological, sewage treatment memors. The obtogram, geophysical, engineering, and socioeconomic considerations and consequences of recycling secondary treated sewage into the Everglades are examined. A very high degree of treatment appears necessary because of the grave and probable prohibitive problems involved in the recycling of sewage treated to this level. (Smith-Texas) LEUKEMIAS IN THE CRACOW REGION IN THE YEARS 1961-1968 AND THE WATER SUPPLY OF THE POPULATION, Medical Academy, Krakow (Poland).

K. Janicki.

Acta Med Pol. Vol 13, No 1, p 73-87. 1972. Illus.

Identifiers: "Public health, "Human diseases,

*Cracow, "Leukemias, Poland, Human population, Toxicity, Water pollution effects, Water
supply.

The second of a series of analytical studies on the influence of environmental factors on the epidemiology of leukemias in the Cracow region in the years 1961-1968 is presented. From the standpoint of the etiopathogenesis of leukemias, water may act as a carrier of infectious factors, or may alter physicochemical properties of the body, due to pollution by various toxic substances. An evaluation was made of the morbidity of leukemias in various administrative units of the region in relation to the water supply to the population for drinking and domestic purposes.—Copyright 1972, Biological Abstracts, Inc.

THE EFFECT OF TEMPERATURE ON THE DEVELOPMENT OF RESTING EGGS OF DIAPTOMUS OREGONENSIS LILLJ (COPEPODA: CALANOIDA), Toronto Univ. (Ontario). Dept. of Zoology.

J. M. Cooley. Limnology and Oceanography, Vol 16, No 6, p 921-926, November 1971, 3 fig, 1 tab, 21 ref.

Descriptors: "Aquatic environment, "Tempera-ture, "Growth rates, Biology, Cytological studies, Reproduction, Metabolism, Aquatic animals, Lakes, Seasonal, Biorhythms, Water temperature, Canada, "Copepods. Identifiers: "Diaptomus oregonensis, "Teapot

Diaptomus oregonensis in Teapot Lake produces diapausing eggs between October and the time in November when a fall overturn deoxygenates the water and kills all zooplankton. The only visible difference between resting and subitaneous eggs was that the former were reddish-brown and the latter green. Resting eggs incubated in the laboratory at about 4C in October and November will hatch at about the same time the following spring in the laboratory as in Teapot Lake, but they can be induced to hatch sooner at higher temperatures if they have experienced about 3-4 weeks at 4C. Diapausing eggs that have not initially experienced. n usey nave experienced about 3-4 weeks at 4C. Diapausing eggs that have not initially experienced the low temperature are capable of surviving at warmer temperature (14C) for extended periods and can subsequently be induced to hatch by exposure to cold. (Jerome-Vanderbilt)

QUANTITATIVE EVIDENCE FOR PROTEIN DENATURATION AS THE CAUSE OF THER-

MAL DEATH, Michigan State Univ., East Lansing. Dept. of Biophysics. B. Rosenberg, G. Kemeny, R. C. Switzer, and T.

C. Hamilton re, Vol 232, No 5311, p 471-473, August 13,

1971. 2 fig. 1 tab, 18 ref.

Descriptors: "Heat, "Proteins, "Microorganisms, "Thermal pollution, Biochemistry, Cytological studies, Temperature, Thermodynamics, Metabol-ism, Yeasts, Viruses, Bacteria. Identifiers: "Protein denaturation.

A good numerical correlation between certain thermodynamic parameters in protein denaturation and death rates of unicellular organisms is reported. This correlation was investigated after compensation law behavior was observed in work on protein denaturation by Williams and Milby. It was concluded that virtually all proteins in a variety of conditions were denatured at elevated

Group 5C-Effects of Pollution

temperatures according to this compensation law.
Correlations were found in yeasts, virus and bacteria. Four hypotheses connecting protein denaturation with cell death, which can be shown mathematically, could lead to appropriate kinetics and thermodynamics. These are (a) that there is a statistical distribution of protein concentration thresholds in the population of cells; (b) that the stress on the cell to create protein to compensate the denaturation rate is the cause of death; (c) that the stress on the cell to prevent the accumulation the stress on the cell to prevent the accumulation of denatured protein debris kills the cell; or (d) that the mathematical correlation of death rate to protein denaturation is due to destruction of a single protein molecule in the cell. (Jerome-Van-derbilt)

BREEDING HABITS AND EMBRYONIC THER-MAL REQUIREMENTS OF THE FROGS, RANA AURORA AND RANA PRETIOSA PRETIOSA, IN THE PACIFIC NORTHWEST, British Columbia Univ., Vancouver. Dept. of

Zoolo

Ecology, Vol 52, p 116-124, 1971. 2 fig, 3 tab, 14

Descriptors: *Pacific Northwest U.S., *Frogs, *Breeding, *Temperature, Embryonic growth stage, Lethal limit, Toxicity, Solar radiation, Climate, *Thermal pollution.

Identifiers: *Thermal requirements, Breeding

Embryonic thermal adaptations of two species of frogs from the Pacific Northwest are described. Limits of temperature tolerance of young R. au-rora embryos are about 4-21 C. For another spe-cies, R. pretiosa, the lethal thermal limits of young embryos are approximately 6-28 C. The tol limits broaden as embryos become older, and embryos of both species can survive short-term expoto normally lethal chronic cold temperatures. Field observations of breeding frogs indicate a correlation between breeding habits - such as initiation of breeding season, time of daily sexual activity, male calling behavior, and spawning site and embryonic thermal requirements. High mortality of R. pretiosa embryos in the field often results from freezing temperatures at night and desiccation of egg masses. These factors do not greatly affect R. aurora embryos. These thermal adaptations of the two western species of Rana are compared with those of species from eastern North America, as an aid in broadening the understanding of the evolutionary strategies within the genus in North America. (Oleszkiewicz - Van-derbilt) W73-07491

STUDIES ON THE DEVELOPMENT OF THE SEA URCHIN STRONGYLOCENTROTUS
DROEBACHIENSIS. II. REGULATION OF
MITOTIC SPINDLE EQUILIBRIUM BY
VIRONMENTAL TEMPERATURE,
Marine Biological Lab., Woods Hole, Mass.

R. E. Stephens

Biology Bulletin, Vol. 142, No 1, p 145-159, February 1972. 3 fig, 1 tab, 40 ref. PHS-GM-15,-

Descriptors: *Genetics, *Environmental effects, *Aquatic animals, *Temperature, Biology, Biochemistry, Thermal properties, Reproduction, Growth rates, Proteins, Thermal pollution, Growth rates.

Identifiers: *Sea urchins, Tubulin,

The assembly and function of the mitotic ap-paratus in first division eggs of the sea urchin, Strongylocentrotus droebachiensis were studied at 0 C and 8 C by polarization microscopy in vivo and after isolation in hexylene glycol at controlled pH. The mitotic apparatus in cells grown at 0 C were anastral, while those grown at 8 C were amphiastral. At 0 C only about 1/2 the spindle fiber monomer was available for polymerization as at 8 C and the amount of material available was specified by the temperature at prophase with tem-perature prehistory having no effect. The tempera-ture coefficient for activation differs markedly from that of the mitotic process as a whole. The amount of tubulin obtained from an isolated amount or tubulin obtained from an isolated mitotic apparatus was directly proportional to its measured retardation. All these results are compatible with the mitotic dynamic equilibrium theory of Inoue and complement this theory through the data presented. (Jerome - Vanderbilt) W73-07494

SEASONAL CHANGES IN THE EXTRATHY-ROIDAL DISTRIBUTION OF IODIDE IN THE TELEOST FISH THE BURBOT, LOTA LOTA L., New Brunswick Univ., Fredericton. Dept. of Biology. Biology. A. J. Wiggs.

Canadian Journal of Zoology, Vol 49, No 12, p 1505-1511, 1971. 3 fig, 23 ref.

Descriptors: "Freshwater fish, "Metabolism, *lodide radioisotopes, "Seasons, Biology, Biochemistry, Radiochemical analysis, Distribu-tion, Temperature, Sampling, Laboratory tests, *Teleosts. Identifiers: *Burbot

The distribution of radioactivity in tissues of adult burbot weighing 1 to 3 kg was determined by mea-suring the T/S ratio (tissue radioactivity/serum radioactivity) at intervals after the injection of radioiodide. In one instance the skin which comprises 12% of body weight of the burbot showed a T/S ratio of 29.3 and accounted for up to 27% of the injected dose of radioiodide. By comparison, in another study, the thyroid showed a T/S ratio of \$2.2 accessering 2.2% of the injected dose of 5.2, representing 2.2% of the injected dose at 9.5 C. The radioactivity (T/S ratio) in the skin increased until 30 h after injection and then declined. Non-radioactive iodide values of skin and serum were determined on a natural population over the course of a year. Values for skin iodide ranged course of a year. Values for skin ionide ranged from 27 micrograms/100 g to 816 micrograms/100 g while serum iodide values ranged from 7 micro-grams/100 mi to 30 micrograms/100 ml. These values also indicate the magnitude of seasonal variation, which, in the case of serum iodide concentration, parallels the seasonal changes in lake temperature. The results suggest that the skin may serve as an equivalent lodide reserve in the burbot where the blood does not bind iodide. (Jerome Vanderbilt) W73-07495

THE EFFECT OF TEMPERATURE ON THE ACTIVITY OF BLUEFISH, POMATOMUS SAL-TATRIX L., National Marine Fisheries Service, Highlands, N.

National Marine Pisheries Service, Fighands, N. J. Sandy Hook Sport Fisheries Marine Lab. B. L. Olla, and A. L. Studholme.
Biology Bulletin, Vol 141, No 2 p 337-349, October

1971. 2 fig, 2 tab, 28 ref.

Descriptors: *Marine fish, *Environmental effects, *Thermal pollution, *Fish behavior, Marine biology, Aquatic environment, Metabolism, Biorhythms, Schools (fish).
Identifiers: *Bluefish.

How changes in the temperature of the environ-ment affect established behavior patterns in a marine pelagic species is discussed. Six adult bluefish were acclimated to water in a tank, which was held at 19.9 C for a period just before changes were introduced. The light on the tank was also controlled to simulate the photoperiods of different seasons. In one experiment the water temperature was lowered gradually to a limit of 11.9 C. In another it was raised to a limit of 30.4 C. At both the high and low levels, swimming speed increased noticeably, feeding and schooling patterns were disrupted, and day-night rhythms were upset. The fish pecodyered from the effects of low tempera-tures to return to normal behavior quickly, while they took up to two days to recover from hi peratures. The swimming reaction at both ex-tremes is believed to be a mechanism to move them out of areas of adverse temperature. (Jerome - Vanderbilt) W73-07497

CHESAPEAKE RESEARCH CONSORTIUM INC. ANNUAL REPORT JUNE 1, 1971-MAY 31, For primary bibliographic entry see Field 02L. W73-07543

TOTAL AND ORGANIC MERCURY IN MARINE FISH, Hawaii Univ., Honolulu. Pacific Biomedical Research Center. For primary bibliographic entry see Field 05A. W73-07576

SOURCES OF NUTRIENTS IN CANADARAGO

New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05B.
W73-07593

MERCURY METHYLATION IN AN AQUATIC ENVIRONMENT, Beak (T.W.) Consultants Ltd., Toronto (Ontario).

Lab. Div. For primary bibliographic entry see Field 05A. W73-07594

ENVIRONMENTAL IMPACT OF DETERGENT

BUILDERS IN CALIFORNIA WATERS, California Univ., Berkeley. Sanitary Engineering Research Lab. D. Jenkins, W. J. Kaufman, P. H. McGauhey, A. J. Horne, and J. Gasser. Water Research, Vol 7, Nos 1/2, p 265-281, Janua-

ry/February 1973. 4 fig, 3 tab, 33 ref.

Descriptors: *Phosphorus, *Eutrophication, *Detergents, *California, Water pollution sources, *Nitrogen, Limiting factors, Industrial wastes, ipal wastes, Agricultural runoff, Urban runoff, Fertilizers, Phosphates, Water pollution con-trol, Nutrients, Waste treatment, Carbon, Runoff. Identifiers: *Lake Tahoe, *Clear Lake (Calif), *San Francisco Bay.

Most nationwide estimates in the United States Most nationwise estimates in the policy the point source phosphorus contributions to surface waters between 70-90 percent (in California this is between about 80-90 percent) and the policy than the policy t point source nitrogen input to something less than 50 percent of the total nitrogen load (in California this is about 40 percent). Detergents appear to represent somewhere on the order of 20-40 percent of the total phosphorus released to waters. On an overall basis, if control of both nitrogen and hosphorus were to be necessary it would be feasiphosphorus were to be necessar, and ble to control phosphorus because some 80-90 percent of it arises from point sources, but it wou cent of it arises from point sources, but it would be virtually impossible to control nitrogen as well or as completely because of the high percentage contributed from diffuse sources, and because nitrogen can be fixed from the atmosphere by many algae and bacteria. Control of phosphorus input to surface waters by eliminating phosphates from detergents is not of consequence because this phosphate contribution is only some 35 percent of the total phosphate input. Most of the total phosphorus reaching the surface waters of California is contributed by two regions - the South Coastal contributing about 50 percent and the San Francisco Bay Region producing some 15 percent of the total. Of the total phosphorus reaching the waters of the State of California it is estimated that through municipal discharges alone, some 40 percent is directly to the ocean and an additional 17 percent reaches the ocean through municipal discharge to bays and estuaries. Approximately 20 percent of the nitrogen is discharged in municipal wastes directly to the ocean. Discharge from municipal wastes to bays and estuaries accounts for about 10 percent of the total discharge of nitrogen. (Little-Battelle)

SOIL AND FERTILIZER PHOSPHORUS IN THE

RISH ECOSYSTEM, Foras Taluntais, Wexford (Ireland). For primary bibliographic entry see Field 05B. W73-07607

SIGNIFICANCE OF PHOSPHORUS IN LAKES AND COASTAL WATER SEDIMENTS AND

AND COASTAL WATER SEDIMENTS AND BENTHOS, Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland). For primary bibliographic entry see Field 05B. W73-07610

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THE SIGNIFICANCE OF MAN-MADE SOURCES OF PHOSPHORUS: DETERGENTS AND SEW AGE, Upper Tame Main Drainage Authority, Birmingham (England).
For primary bibliographic entry see Field 05B. W73-07612

ENVIRONMENTAL CONSIDERATIONS FOR ESTUARINE BENTHAL SYSTEMS, Oregon State Univ., Corvallis. Dept. of Civil En-

Water Research, Vol 6, No 11, p 1409-1418, November 1972. 3 fig, 1 tab, 13 ref.

Descriptors: *Environmental effects, *Estuaries, *Benthos, Dredging, Channeling, Seasonal, Sulfates, Sulfides, Heavy metals, Oxidation-reduction potential, Organic matter, Model stu-dies, Dissolved oxygen, Methane, Biological com-

Identifiers: *Characterization, Species diversity.

A model of estuarine benthal systems was developed to describe the major chemical interactions and the effect of man's activities on them. Discussion is included on the effects of variation in DO and the presence of sulfates, free sulfide, heavy metals, and other constituents on the nature of the benthic deposits. Benthic samples from Toledo, Oregon, Sally's Bend, Yaquina Bay, Oregon, and Isthmus Slough, Coos Bay, Oregon were analyzed and shown to be typical of three of the five types of estuarine benthal systems. The types are characterized by variations in the amount of aerobic decomposition, sulfate reduction, intersitial free sulfide, and methane fermentation or accumulation of organics. Although benthic systems may be classed as a particular type, seasonal variations may effect significant changes. The effects of man's activities such as organic and inorganic deposition, reduction of seasonal variations, channelization, dredging, spoil disposal, and particle size changes, and the effect of transient conditions on the benthic type and the biological community are also considered. (Little-Battelle) A model of estuarine benthal systems was

NATURAL PHOSPHATE SOURCES IN RELA-TION TO PHOSPHATE BUDGETS: A CON-

TRIBUTION TO THE UNDERSTANDING OF

EUTROPHICATION, Hydrobiologisch Instituut, Nieuwersluis (Nether-

innos). H. L. Golterman. Water Research, Vol 7, Nos. 1/2, p 3-17, Janua-ry/February 1973. 6 fig, 4 tab, 32 ref.

Descriptors: *Eutrophication, *Phosphates, *Water pollution sources, *Lakes, *Cycling nutrients, Path of pollutants, Weathering, Leaching, Erosion, Adsorption, Sediments, Silt, Peat, Clays, Nutrients, Phosphorus, Primary productivity. Identifiers: Mobilization, Phosphorus cycle.

Identifiers: Mobilization, Phosphorus cycle.

Studying the problems of eutrophication resulting primarily from the presence of phosphates must include consideration of the natural resources. Natural levels of phosphates occur as a result of the presence of phosphorus in rocks which is mobilized by weathering, including leaching and erosion. Phosphorus may be transported by adsorption on clay as shown by studies of unpolluted lakes in Africa. Although these lakes contain high levels of phosphates, algal growths are not a problem either because the phosphorus is not in a form available to the algae or because some other factor is limiting. Phosphates may also originate from peat areas; however, these also may not be available to algae. Phosphates adsorbed on sediment particles may be available for algae utilization through enzyme or bacterial action. This phosphate, however, may be readsorbed and consequently be available for only a brief period of time. Recycling of phosphate by biochemical action must also be considered as a means of its being made available for alga utilization. It is concluded that the process of eutrophication is only understandable after measuring not only the P-input, but also the primary production, including its mineralization, and estimating the natural P-losses during the recycling. (Little-Battelle)

WHERE HAVE ALL THE TOXIC CHEMICALS

GONE., Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 05B. W73-07676

BACTERIOLOGICAL WATER QUALITY CHARACTERISTICS OF FORT LOUDOUN RESERVOIR.

essee Univ., Knoxville. Dept. of Civil Engineering.

J. B. Asthana, and J. C. Burdick III.

Tennessee Water Resources Research Center, Knoxville, Price \$3.00. Research Report No. 21, 1972. 102 p, 19 fig, 23 tab, 43 ref, 3 append. OWRR A-013-TENN (4), 14-31-0001-3243.

Descriptors: "Water quality, "Bacteria, Self-purification, Mathematical models, Model studies, "Coliforms, "Tennessee, Density. Identifiers: "Fort Loudoun Reservoir (Tenn).

The relationship between coliform bacteria concentrations and other water quality parameters in Fort Loudoun Reservoir was examined. Mathematical models were developed using multiple regression techniques to predict the density of coliform bacteria at any location on the reservoir. The rate of bacterial selfpurification was studies and die-away constants were determined for the classical Chick's law as well as a more generalized retardant relationship. The effects of environmental factors such as temperature, flow, and turbidity upon the rate of decrease of bacterial concentrations were examined. The significance of the ratios of total coliform to fecal coliform concentrations and of fecal coliform to fecal streptococci concenand of fecal coliform to fecal streptococci concentrations were discussed with reference to Fort Loudoun Reservoir bacterial water quality. The effluent from a municipal waste water treatment

plant is discharged in the upper reaches of the reservoir. This plant was modified from a primary treatment unit to a secondary one in 1968, so that the effect of this treatment modification on the water quality of Fort Loudoun Reservoir was considered. The facts obtained and the general principles deduced therefrom should be helpful in evaluating the changes in bacterial water quality that are likely to occur in the future. (Larson-Tennessee) W73-07723

LOS ALAMOS LAND AREAS ENVIRONMEN-TAL RADIATION SURVEY 1972, Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 05B. W73-07756

DISTRIBUTION AND CYCLING OF RADIOAC-TIVE ISOTOPES RELEASED INTO THE SAVANNAH RIVER SWAMP FOREST: EN-VIRONMENTAL IMPLICATIONS, PROGRESS REPORT, NOV 1, 1971-AUG 1, 1972. Savannah River Ecology Lab., Aiken, S. C. For primary bibliographic entry see Field 05B. W73-07757

NUTRIENT ENRICHMENT AND EUTROPHI-CATION OF LAKE MICHIGAN, PROGRESS REPORT NOV. 1, 1968 TO JULY 31, 1972, Michigan Univ., Ann Arbor. Great Lakes Research Div. C. L. Schelske.

Available from NTIS, Springfield, Va., as COO-2003-17; \$3.00 in paper copy, \$0.95 in microfiche. Report COO-2003-17, July 1972. AEC-AT (11-1)-2003.

Descriptors: *Eutrophication, *Lake Michigan, *On-site investigations, *Nutrient requirements, Nutrient removal, Nutrients, Cycling nutrients, Diatoms, Phytoplankton, Phosphorus compounds, Nitrogen compounds, Nitrogen cycle, Silicates, Lakes, Great Lakes, Path of pollutants.

Past work included surveys and experiments with ecological perturbation and nutrient enrichment. Work in progress includes (1) a plastic-bag technique for nutrient experiments, and (2) an environmental study of southern Lake Michigan. A model for prediction and assessment was formulated on the hypothesis that P is the limiting nutrient. The rate of eutrophication is given by the rate of utilization of Si, required by the diatoms, or of N. (Bope-ORNI.) of N. (Bopp-ORNL) W73-07765

1971 ENVIRONMENTAL RADIATION LEVELS IN THE STATE OF NEW JERSEY, New Jersey Dept. of Environmental Protection, Trentoa. Div. of Environmental Quality. For primary bibliographic entry see Field 05B. W73-07770

SURVEY OF ENVIRONMENTAL RADIOAC-TIVITY.
Minnesota State Dept. of Health, Minneapolis.
For primary bibliographic entry see Field 05B.
W73-07771

ENVIRONMENTAL RADIOACTIVITY IN DENMARK IN 1971,
Danish Atomic Energy Commission, Riso
(Denmark). Health Physics Dept.
For primary bibliographic entry see Field 05B.
W73-07779

ENVIRONMENTAL SURVEILLANCE AT HAN-FORD FOR CY-1971 DATA, Battell-Pacific Northwest Labs., Richland, Wash. For primary bibliographic entry see Field 05B.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects of Pollution

W73-07785

THE VEGETATION OF EUTROPHIC BROOK-SIDE SWAMPS IN TAIPALEENSUO, HATTU-LA, SOUTH FINLAND, Helsinki Univ. (Finland). Dept. of Botany.

Heisinsi Univ. (rimand). Iept. oi Botany.
P. Pakarinen, and P. Uotila.
Acta Agral Fenn. 123. p 33-38, 1971, Map.
Identifiers: Brookside, Carex-Acutiformis-M,
*Eutrophication, *Finland, Hattula, PhragmitesCommunis-M, *Swamps, Taipaleensuo, Vegeta-

Only slight differences between the swamps were observed. Most important was the occurrence of Phragmites communis and Carex acutiformis exclusively in stands of their own, despite the similarity of other components of the vegetation.—Copyright 1972, Biological Abstracts, Inc. W73-07791

5D. Waste Treatment Processes

REDUCING WATER POLLUTION FROM PULP

MILL SULFITE WASTES,
Michigan Technological Univ., Houghton. Dept.
of Civil Engineering.
M. F. Jurgensen, and J. T. Patton.
Available from the National Technical Informa-

Available from the National Technical Informa-tion Service as PB-218 707, \$3.00 in paper copy, \$0.95 in microfiche. Michigan Institute of Water Research, East Lansing, Project Completion Re-port, December, 1972. 5 p. OWRR A-059-MICH (1) and B-027-MICH (1). 14-01-0001-3522.

Descriptors: *Pollution abatement, *Pulp wastes, Water pollution, *Sulfite liquors, *Waste water treatment, Chemical oxygen demand, Microbial Identifiers: *Desulfovibrio

The pollution characteristics of Spent Sulfite Liquor (SSL) can be reduced by using the SSL as a substrate for the growth of the bacteria, Desul-fovibrio. Total Sulfur Content (TSC) and Chemical Oxygen Demand (COD) of the SSL were used to measure the pollution characteristics of the SSL. measure the poliution characteristics of the SSL.
Also, tests on the removal of particulate matter
from the digested waste material were run. This
work continues. The emphasis of the present work
is on the nutritional aspects and physical constants
(such as temperature and pH) of the SL which will increase microbial action, thus increasing digestor efficiency. It is recommended that additional work be done in the clarification of the digestor effluent and the recovery of the S from the insoluble FeS.

SEWERAGE AND WATER PLANNING RE-PORT (FOR) METROPOLITAN COUNCIL OF THE TWIN CITIES AREA, MINNESOTA. Metcalf and Eddy, Inc., Boston, Mass

Metropolitan Council of the Twin Cities Area, St. Paul, Minnesota, November, 1968, 185 p., 23 fig., 34 tab, append.

Descriptors: *Sewerage, *Sewerage systems, Sewage disposal, Sewage districts, Water quality, Water supply, Planning, Water demand, Recrea-tion, Rivers, Projections, Population, Land use,

*Minnesota.
Identifiers: *Metropolitan management, *Min-

neapolis-St. Paul.

A sewerage plan is outlined for the Twin Cities Metropolitan area including seven counties. The emphasis is on sewerage systems and service areas emphass is on severage systems and service areas but concern for water quality and use of the local rivers and for future water supply demands is in-cluded. The planning report has special sig-nificance in that it is prepared for the Metropolitan Council of the Twin Cities which has considerable powers to plan and implement metropolitan wide

sewerage systems. The planning has a long-term orientation as it delineates service areas, locates sewerage systems. The planning has a long-term orientation as it delineates service areas, locates possible treatment plant sites, and emphasizes population and land use projections. Metropolitan comprehensive planning, the water quality of the Minnesota Rivers, computer models, planning criteria, recreational use of the rivers, and centralized treatment plants are discussed. The recommendations generally call for comprehensive and integrated planning and management, more detailed studies, and regulatory measures on effluent discharges and land use practices. (Elfers-North Carolina) North Carolina)

ELODEA NUTTALLII AS A COMPONENT OF A MANAGED WASTEWATER TREATMENT

Michigan State Univ., East Lansing. Inst. of Water

Technical Report No. 25, March 1972. 35 p. 7 fig, 6 tab, 45 ref. OWRR A-031-MICH (3).

Descriptors: Aquatic plants, *Wastewater treatment, *Sewage lagoons, *Rooted aquatic plants, Light intensity, Phosphorus, Nitrogen, Nutrients, Plant growth, Plant morphology, Water chemistry, Carbon, Eutrophication, Productivity, Photosynthesis, Water pollution control, Harvesties, Michigan, Nutriens, Marchaman, Parking, Michigan, Nutriens, Purpose

rinousylatiesis, water pointion traints, rearvesting, Michigan, Nutrient removal.
Identifiers: *Luxury consumption, *Mineral uptake, Elodea nuttallii, Elodea canadensis, Ceratophyllum demersum.

The growth, morphological, and mineral uptake response of Elodea nuttallii in differing environments was studied to determine its efficiency as a nutrient accumulator and its light requirements were also studied to ascertain optimum planting denth in a managed wastewater treatment system. depth in a managed wastewater treatment system. Shoots were transplanted to the third in a series of three wastewater ponds at a depth of 130 cm.; they were also planted in a nutrient poor experimental pond at two depths (90 and 150 cm) to observe resulting differences in tissue concentration of harvestable minerals besides effects of varying light. The data gathered indicate that hydrophytes can absorb substantial amounts of nutrients; for E. nuttallii in particular, and some rooted aquatics in general, it seems that harvesting at one-half a plant's total height would result in removing most of the accumulated mineral nutrients and allow for regrowth. It is concluded that E. nuttallii can absorb large amounts of mineral nutrients (including nitrogen, phosphorus, and carbon), but compared nitrogen, phosphorus, and carbon), but compared to other plants being considered as part of a managed treatment system (specifically Ceratophyllum demersum), its potential as a nutrient remover is lower. (Jones-Wisconsin) W73-07200

EFFECTIVENESS OF SUBSURFACE FILTRA-TION BEDS WITH RESPECT TO SALMONEL LAS

Kiev Research Inst. of General Communal Hygiene (USSR). B. M. Duchinskii.

Available from the National Technical Service as Avamore from the National Technica service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 117-119, October-December, 1970. 1 ref. Trans from Gigiena i Sanitariya.

Descriptors: *Waste water treatment, *Filtration, *Sewage treatment, *Salmonella, Laboratory tests, Groundwater, Water pollution sources, Water quality control, Subsurface waters. Identifiers: *USSR, *Filtration beds.

A laboratory model of subsurface filtration beds was used to study the effect of decontamination of sewage from salmonella. The model filtration beds were packed with medium-grained sand and used for three series of experiments with a different

hydraulic sewage load. Results showed that if the filtering bed of medium-grained sand was 1 meter thick and the load did not exceed 15 liters per day thick and the load did not exceed 15 liters per day per running meter, the irrigation network of the subsurface filtration beds sewage containing up to 1 billion salmonella per liter was purified and the contamination of groundwater by salmonella was prevented. Furthermore, when the subsurface fil-tration beds became biologically mature an in-crease of the sewage load to 30 liters per running meter of irrigation network did not cause con-tamination of the groundwater by salmonella. (Smith-Texas) (Smith-Texas) W73-07284

'BARRIER' ROLE OF MODERN PURIFYING INSTALLATIONS WITH RESPECT TO CHEMI-

CAL INGREDIENTS, Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Environmental Hygiene. S. N. Cherkinskii, L. N. Gabrilevskaya, and V. P.

Laskina.

Available from the National Technical Informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 157-161, October-December, 1970. 2 tab, 5 ref. Trans from Gigiena i

Descriptors: *Treatment facilities, *Industrial Descriptors: "Treatment facilities, "Industrial wastes, "Flocculation, "Sedimentation, 'Filtration, Toxicity, "Waste water treatment, Waste treatment, Effluents, Water pollution control, Water quality control, Organic compounds. Identifiers: USSR.

The possibility exists that the usual physical-chemical processes utilized in purifying installa-tions may alter the properties or concentrations of chemical substances brought into surface water bodies by effluents. As a result the purifying installations of waterworks may be a 'barrier' to the industrial pollution of water bodies. With an ex-perimental plant that modelled such processes of perimental plant that modelled such processes of water treatment as floculation, sedimentation, and filtration, an investigation was conducted of the extent of elimination from water of various toxic substances by these means. The results proved the ordinary methods of water treatment widely used in waterworks produced a considera-ble decrease in the concentration in water of both organic and inorganic chemical compounds. (Smith-Texas) (Smith-Tex W73-07286 nith-Texas)

HYGIENIC EFFICACY OF CERTAIN MEA-SURES FOR THE SANITARY PROTECTION OF THE BELAYA RIVER, Nauchno-Issledovatelskii Institut Gigieny i Profzabolevanii, Ufa (USSR). For primary bibliographic entry see Field 05G.

W73.07288

THE HYGIENIC CHARACTERISTICS OF RAPID FILTERS WITH A DRAINAGE SYSTEM OF POROUS CONCRETE, Municipal Sanitary-Epidemiological Center,

Municipal Sanitary-Epidemiological Center, Pyatigorsk (USSR). A. P. Bukhtoyarov. Available from NTIS as part of TT-7-50048/4, \$3.00 in paper copy, \$0.95 in microfich. Hygiene and Sanitation, Vol 35, Nos 10-12, p 406-407, Oc-Sanitariva.

Descriptors: *Filtration, *Waste water treatment. *Water treatment, Separation techniques, Treatment facilities, Water quality control, Sewage treatment, Porous media, Concretes, *Drainage

systems. Identifiers: *USSR, *Rapid filtration beds.

New designs for rapid filters using drainage through porous concrete without a supporting bed

of gravel have been developed by the Rostov-on-Don Scientific Research Institute of the Academy of Municipal Economy. The porous concrete drainage of filters replaces the supporting bed of gravel or crushed stone and is free from the short-comings of pipe drainage. Transparency, bac-teriological indices, filtration rates, and flushing processes are described. Although the investiga-tion provided a favorable evaluation of rapid fil-ters with porous concrete as their drainage systems, there is a need for technical specifica-tions for such systems and for a definition of the conditions for their employment in water works with highly mineralized waters. (Smith-Texas) W73-07292 of gravel have been developed by the Rostov-on-

HYGIENIC EVALUATION OF SANITARY
MEASURES FOR THE LUGAN AND OLKHOVAYA RIVERS IN THE VOROSHILOVGRAD AREA,
Municipal Sanitary-Epidemiological Center,
Voroshilovgrad (USSR).
For primary bibliographic entry see Field 05B.
W73-07293

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ON THE FEASIBILITY OF COMPREHENSIVE UTILIZATION OF INDUSTRIAL AND DOMESTIC AND FECAL EFFLUENTS IN A MINING COMBINE,
Gosudarstvennyi Meditsinskii Institut, Orenburg

(USSR).

For primar W73-07294 nary bibliographic entry see Field 05G.

SANITARY PROTECTION OF WATER BODIES AGAINST POLLUTION BY EFFLUENTS FROM THE MANUFACTURE OF FIBERGLASS-REI-NFORCED PLASTICS, Kiev Research Inst. of General Communal Hy-

giene (USSR). For primary bibliographic entry see Field 05C. W73-07296

NEW SMALL SCALE SEWERAGE INSTALLA-

TION, Meditsinskii Institut, Kiev (USSR).

E. I. Goncharuk, and Ya. M. Kaminskii E. I. Goncharuk, and Ya. M. Kaminskii. Available from the National Technical Informa-tion Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.95 microfiche. Hygiene and Sanita-tion, Vol 35, Nos 7-9, p 101-105, July-September, 1970. 3 fig, 7 ref. Trans from Gigiena i Sanitariya.

Descriptors: *Sewage treatment, *Waste water treatment, Waste treatment, Fültration, *Settling basins, Oxidation lagoons, Aeration, Treatment facilities, Trickling filters, Design criteria, Water quality control, Pollution abatement. Identifiers: *USSR, *Isolated area sewerage.

For hygienic, economic, and other reasons, sewage treatment installations of complex design and operation used in cities and towns are hardly suitable for rural areas or isolated units. Until recently, the small scale sewerage installations recognized for hygiene were limited to small surface sewage farms, filtration beds, and trickle biofilters. Now, however, a fairly extensive list of small scale sewerage installations exists. This includes surface sewage farms and filter beds, subsurface filter beds, and gravel filters, filter trenches, filter wells, circulation oxidizing channels, aeration installations for complete oxidation, trickle bio-filters, tower bio-filters, and biological trickle bio-filters, tower bio-filters, and biological nuckie bio-litters, tower bio-litters, and biological ponds. A compact, small-capacity sewage treatment unit proposed by a Finnish firm Upo-Vesipoika is described. The unit could provide sewerage facilities for isolate units in rural or sub-upond areas such as hospitals, out-of-town restaurants, camping sites, railroad stations, etc. (Smith-Texas) Texas) W73-07298

ON THE USE OF MINE WATERS FOR WATER

SUPPLY IN VORKUTA, Municipal Sanitary-Epidemiological Center, Vor-kuta (USSR).

kuta (USSN).

V. A. Dorogovtsev.

Available from the National Technical Information Service as part of TT70-50048/3, 33.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 294-295, July-September, 1970. Trans from Gigiena i Sanitariya.

Descriptors: Mine drainage, *Water supply, *Potable water, Water pollution, Water pollution control, Water pollution sources, Water quality, Water reuse, Industrial wastes, Treatment facilities, *Filtration, *Waste water treatment, *Acid mine water.
Identifiers: *Vorkuta, *USSR.

Vorkuta, a transpolar coal mining center with a population exceeding 200,000, gets its water from the Vorkuta River and from subsurface waters. However, water consumption in the area is increasing steadily and for the immediate future, pending the construction of a planned water pipeline from the Usa River, the water deficit will be covered by mine waters. The mine water is purified in two stages: (1) settling and filtration, and (2) disinfection with calcium hypochloride. The purified mine water is successfully used for technical and domestic needs. The use of mine waters considerably reduces the total quantity of effluents, promising a substantial improvement in the sanitary state of water bodies. (Smith-Texas) W73-07307

PRIVY VAULT WASTE STUDY, For primary bibliographic entry see Field 05B. W73-07333

CASE STUDIES OF DESALTED WATER FOR IRRIGATION, Bureau of Reclamation, Denver, Colo.

For primary bibliographic entry see Field 03A. W73-07334

INDUSTRIAL WASTE DISPOSAL. Thermal Research and Engineering Corp., Conshohocken, Pa.

Van Nostrand Reinhold Company, New York, N.Y., 1968. R. D. Ross, editor. 340 p.

Descriptors: Pollution abatement, disposal, "Waste treatment, "Waste water disposal, Incineration, Radioactive wastes, Radioactive waste disposal, Solid wastes, Liquid wastes, "Industrial wastes, Economics, Waste water treatment, Water reuse.

Identifiers: Gaseous wastes, Recovery (Waste), Odor control.

Odor control.

All aspects of modern industrial plant waste disposal are examined; emphasis is placed on the importance of correct sequence in the successful application of procedures. Gascous, liquid, and solid waste disposal are treated as three separate yet interdependent problems; methods for solving them together are given. All basic methods of waste disposal are set forth, and the less familiar ones are fully described in regard to theory, practice, economics, and equipment. A comprehensive analysis of disposal problems in general is followed by an examination of each of the available routes to their solution; recovery, direct disposal, semi-disposal, waste treatment, radioactive wastes, incineration, and reuse. Procedural, economic, theoretical, and political aspects of the economic, theoretical, and political aspects of the waste disposal problem are considered. Basic facts wase uspons problem are considered. Basic facts and ideas are provided which can be used in formulating solutions to future, problems; the main thrust is directed to the attention of the plant engineer, giving him the basic knowledge to solve a given problem. (Smith-NWWA)

WASTEWATER COLLECTION NETWORK DESIGN BY GEOMETRIC PROGRAMMING, Massachusetts Inst. of Tech., Cambridge.

M. Sc. thesis January, 1973. 103p, 1 fig, 5 tab, 77 equ, 47 ref, 1 append.

Descriptors: "Waste water (Pollution), "Design, Optimization, Planning, Algorithms, Equations, Constraints, Costs, Pumping, Pipelines, Flow, Storm runoff, Mathematical models, Systems

Identifiers: *Waste water collection, *Collection networks, "Geometric programming, Pressurized pipeline technology, Storage facilities, Municipal waste water, Slack variables, Convex approximant technique.

An overview of waste water collection networks is presented, particularly to contrast the features of conventional collection networks with the new concept of applying pressurized pipeline technology to collection networks. A literature review is included that describes work related to the design of waste water collection networks. A design of a pressurized waste water collection network consisting of pipes, pumps, and storage facilities is formulated as a geometric programming problem. Two example problems are given which demonstrate the strengths and weaknesses of the design the chinque. At present, geometric programming apechanique. strate the strengths and weaknesses of the design technique. At present, geometric programming appears to be the best technique available for handling nonlinear problems containing continuity-type equations. It can be used in the design of pressurized waste water collection networks, especially if the sizes of storage facilities can be estimated for actual networks. (Bell-Cornell) W73-07365

TREATMENT AND USE OF SLUDGE, Water Economics Research Inst., Warsaw (Poland). For primary bibliographic entry see Field 05F. W73-07444

BIOLOGICAL REMOVAL OF PHOSPHATES FROM WATER, Hach Chemical Co., Ames, Iowa. D. E. Greer, and C. D. Ziebell. Journal of the Water Pollution Control Federation, Vol 44, No 12, p 2342-2348, December, 1972. 2 fig.

Pescriptors: *Waste water treatment, *Phosphates, *Biological treatment, Algas, Phosphorus, Water pollution, Eutrophication, Water pollution control, Water pollution treat-ment, Water treatment, Tertiary treatment, Fish, Analytical techniques. Analytical techniques. Identifiers: *Biotic phosphate removers.

The purpose was to explore and evaluate techniques of phosphorus removal from water by biological means. Most of the detailed experiments were conducted in above ground outdoor pools one meter deep with a surface area of 23.6 sq. meters. The results indicate a direct correlation. one meter deep with a surrace area of 2.3.5 sq. me-ters. The results indicate a direct correlation between turbidity intensity and pH elevation. Furthermore, the removal of excess phosphates by precipitation in the form of hydroxyl-apatite without the addition of any reagents is a feasible technique in areas possessing alkaline waters. (Smith-Texas) W73-07449

CHANNEL AERATION ACTIVATED SLUDGE TREATMENT AT GLENWOOD, MINNESOTA, Minnesota Univ., St. Paul. Dept. of Biochemistry. H. O. Halvorson, R. Irgens, and H. Bauer. Journal of the Water Pollution Control Federation, Vol 44, No 12, p 2266-2276, December, 1972. 11 tab, 3 ref.

Descriptors: *Channels, *Aeration, *Activated sludge, *Waste water treatment, Treatment facili-

Group 5D—Waste Treatment Processes

ties, Pilot plants, "Nitrogen, "Phosphates, Nutrients, Algae, Water pollution control, Water quality control, Eutrophication, Illinois, "Min-

Identifiers: *Channel aeration, *Glenwood (Minn).

The City of Glenwood, Minnesota, was chosen as a suitable site for a channel aeration demonstration plant after laboratory studies indicated that the channel process could remove from the waste water significant quantities of plant nutrients such as aitrogen and phosphate. The plant consisted of a laboratory building and control house; an aeration channel equipped with the necessary aeration and propulsion devices; a final settling tank; weir boxes and automatic sampling equipment for the anu proputson oevices; a final settling tank; weir boxes and automatic sampling equipment for the raw waste water and the effluent; and finally, an auxiliary stabilization pond. Tables give the results of the plant operation for a two year period. (Smith-Texas) W73-07450

PHYSICAL-CHEMICAL TREATMENT FOR WASTEWATER, Robert A. Taft Water Research Center, Cincin-

nati, Ohio. J. M. Cohen, and I. J. Kugelman. Water Research Vol 6, p 487-492, 1972. 3 fig, 2 tab,

Descriptors: *Waste water treatment, *Water waste water treatment, "Water treatment, streatment facilities, Disinfection, Pilot plants, Cost analysis, Biological treatment, Water quality control, Water quality, Water pollution control. Identifiers: *Chemical treatment.

The most advanced physical-chemical treatment scheme is the clarification-adsorption system with grit removal and disinfection. Clarification and fil-tration remove colloidal solids and, with proper chemical dosing, phosphates. Activated carbon absorption removes soluble organics. Several pilot absorption removes soluble organics. Several pilot plants have operated with success, and full scale plants are planned for the future. Definitive cost data will not be available until full scale plants are operating, but estimates indicate that the cost will be essentially the same as for biological treatment with time treatment. (Anderson-Texas) W73-07452

DISCUSSION OF THE DESIGN PARAMETER FOR SECONDARY SEDIMENTATION TANKS, Emschergenossenschaft, Essen, (West Germany).

Water Research, Vol 6, p 429-431, 1972. 3 fig, 2

Descriptors: *Design criteria, *Design data, *Design standards, Sludge treatment, *Waste water treatment, Water treatment, Treatment facilities, *Settling basins, Water pollution control, Organic loading, Water quality control. Identifiers: *Primary settling tanks, *Secondary settling tanks, *Secondary settling tanks.

Design data used for primary settling tanks are in-adequate for the design of secondary settling tanks due to their different functions and to the charac-teristics of activated sludge. Also needed as data are the solids loading and the sludge volume index. The mutual influence of the activated sludge and settling tanks must be considered especially in fix-ing recycle ratios. The graphs are included to aid in selecting design data. (Anderson-Texas) W73-07453

DESIGN PARAMETERS FOR SLUDGE TREAT-MENT: INTERPRETATION OF OPERATION DATA FROM SEVEN ACTIVATED SLUDGE PLANTS FOR MUNICIPAL SEWAGE, Gewasserschutzabteilung Kanton Zurich, (Switzerland).

Water Research, Vol 6, p 495-497, 1972. 3 fig. 1

Descriptors: *Design criteria, *Design data, *Sludge treatment, *Waste water treatment, Gases, Sewage treatment, Treatment facilities, Municipal wastes.
Identifiers: *Digestor gas.

Basic data averages for 7 sewage plants were tabu-lated on a per capita basis. The study periods range from 2 to eleven years. The average gas produc-tion was 538 1 per kg of organic solids, but the variation was about plus or minus 50 percent. This variation must be considered in designing plants which utilize the digestor gas. (Anderson-Texas)

HANDLING OF AEROBIC MINERALIZED SLUDGES BY CENTRIFUGES AND BELT-PRESS FILTERS,

Dwars, Heederik and Verhiey Ltd., Amersfoort -d., (Netherlands). J. Zeper, and R. Pepping. Water Research, Vol 6, p 507-513, 1972. 4 fig.

Descriptors: "Polyelectrolytes, "Centrifugation, "Activated sludge, "Sludge treatment, Waste treatment, Waste water treatment, Separation techniques, Treatment facilities, Cost analysis. Identifiers: "Decanting centrifuge.

The decanting centrifuge used operated at an efficiency of about 35% without polyelectrolytes. With polyelectrolytes efficiency was improved, but thickening remained constant. The most important variables in the belt press operation are belt area, speed and pressure. Polyelectrolyte dosing was judged indispensible. Overall expense of both operations is largely dependent on polyelectrolyte cost. (Anderson-Texas)

W73-07455

CENTRALIZATION OF WASTE TREATMENT FACILITIES, Florida Technological Univ., Orlando, Environ-

mental Systems Engineering Inst.
M. P. Wanielista, and C. S. Bauer.
Journal Water Pollution Control Federation, Vol

44, No 12, p 2229-2238, December, 1972. 6 fig, 5

Descriptors: "Sewers, "Regional analysis, Mathematical studies, Mathematical models, "Waste water treatment, "Waste treatment, Combined sewers, Project planning, Project benefits, "Treatment facilities, Systems analysis.

Identifiers: Centralization, "Regional waste treatments and programments
The objective was to formulate a general model that can be used for planning the location and size of wastewater treatment plants and sewer lines. The use of the model is illustrated by examining an The use of the model is illustrated by examining an existing sewer system within a river basin of limited geographical extent. The model was developed and solved by a mixed integer programming algorithm and the model can be used in most situations to minimize cost. In the example given, about 10% can be saved if planning techniques and optimization models are utilized. (Smith-Texas) W73-07456

POTABLE WATER BACTERICIDE AGENT

DEVELOPMENT, CHEMTRIC, Inc., Rosemont, Ill. For primary bibliographic entry see Field 05F. W73-07457.

A MODEL FOR ALLOCATION OF SEWAGE TREATMENT SYSTEMS TO THE NAVAL FLEET Naval Postgraduate School, Monterey, Calif.

E. A. Brill. Avialable from the National Technical Informa-tion Service as AD-747066, \$3.00 in paper copy, \$0.95 in microfiche. July 1972. 19 p, 1 fig, 1 tab, 2

Descriptors: "Markov processes, "Sewage treat-ment, "Waste water treatment, "Treatment facili-ties, "Project planning, Project benefits, Project life, Sewage, Model studies, Cost analysis, Cost comparisons, Economics. Identifiers: "Naval sewage systems.

The problem of planning the allocation of sewage treatment systems to the Naval Fleet is discussed. It is assumed that the obsolescence or deterioration process of a ship is a semi-Markov process. The total discounted cost of revamping a group of ships is determined as a function of the time horizon chosen to do so for the special case of deterministic deterioration. This function is graphed for a set of representative cost factors. A view towards a future simulation study is provided by a discussion of the semi-Markov and Markov models. (Smith-Texas) W73-07458

FINAL REPORT OF PHASE I, DEVELOPMENT PROGRAM OF A CONTINUOUS REGENERAT-ING MOVING BED TO REMOVE OIL FROM OIL-WATER SUSPENSIONS, OIL-WATER SUSPENSIONS, Hydronautics, Inc., Laurel, Md. For primary bibliographic entry see Field 05G.

POTATO STARCH FACTORY WASTE EF-FLURNTS, H.L. RECOVERY OF ORGANIC ACIDS AND PHOSPHATE, Eastern Regional Research Lab., Philadelphia, Pa. J. H. Schwartz, S. Krulick, and W. L. Porter. Journal of the Science of Food and Agriculture, Vol 23, No 8, p 977-985, August, 1972. 3 fig, 5 tab,

Descriptors: *Industrial wastes, *Waste water treatment, *Waste treatment, Anion exchange, Proteins, Temperature, Water quality control, Water pollution control, Water pollution sources, Separation techniques, *Phosphates, Water reuse. Identifiers: *Potato starch factory wastewater.

The use of anion exchange resins for removal of acids from potato starch factory wastewater after prior removal of proteins and amino acids was stued. This process removed over 99% of the acids. cued. Into process removed over 97% of the acids. Data are given on the effect of influent temperature and flow rate on column efficiency during the acid adsorption step. Increasing the alkalinity of the eluating agent or recycling the eluate are methods of increasing the concentration of acids in the eluate. Possible uses of the eluate are discussed. (Smith-Texas)

SEWERAGE PLAN INVOLVES OPEN SPACE PRESERVATION,

Inter-American Development Bank, Washington, D.C.

C. Y. Li. Civil Engineering, Vol 43, No 1, p 85-86, January

Descriptors: "Sewerage, "Sewage treatment, "Waste water treatment, "Project planning, Sewers, Water pollution control, Water quality control, Pollution abatement, "Regional development, Water pollution sources, "Pennsylvania. Identifiers: *York County (Penn).

York County, Pa. has installed an area-wide Com-prehensive Sewerage Plan. The overall concept is to emphasize a concentrated development pattern within the Compact Urban Development Centers, to encourage growth of Satellite Centers so as to absorb some development pressures from major

urban areas, to designate self-sufficient Village Centers for people who choose to live in a rural environment, and to keep highway oriented industrial and commercial Highway Impact Areas from growing rampantly. The implementation of this plan must rely on an approach which proceeds concurrently on a multitude of fronts, by a multitude of agencies, and with a multitude of methods. (Smith-Texas)

OPERATING EXPERIENCE AND RESULTS USING THE SIMULTANEOUS PRECIPITATION OF PHOSPHATES IN ACTIVATED SLUDGE PLANTS FOR 5000 TO 30,0000 INHABITANTS IN THE CANTON OF ZURICH, Gewasserschutzabeilung Kanton Zurich (Switzerland).

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Water Research, Vol 6, p 477-479, 1972. 2 fig, 3

Descriptors: *Treatment facilities, *Precipitation, *Separation techniques, *Waste water treatment, *Waste treatment, Chloride, *Phosphorus, Floculation, Water quality control, Sewage treatment, Water pollution treatment.

Identifiers: *Zurich (Switzerland), Phosphorus

All eighteen sewage treatment plants in the Canton of Zurich have adopted simultaneous precipitations with ferric chloride as a phosphorus removal scheme. This generally consists of a storage tank and a dosing device which regulates the dose with respect to changing load. The point of application and exact dose required must be determined individually. Operation problems include poor mixing, poor flocculation, and underdosing for economy. Performance is improved by indoor housing of the storage tank in cold weather. (Anderson-Texals) as) W73-07465

FOCUS ON BLEACHING,

A.W.J. Dyck. American Paper Industry, Vol 53, No 4, p 26-29, April, 1971. 3 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Oxygen, *Waste treatment, *Waste water treatment, Water pollution control, Chemical to the pollution control, Chemical

reactions.
Identifiers: *Oxygen bleaching.

Oxygen bleaching of pulp, first tried in Russia in the 50's and later improved in France, claims such the 50's and later improved in France, claims such advantages as lower chemical consumption, lower operating costs and abatement of water pollution. Early mechanical problems are being solved, resulting in increased capital expenditure. In conventional chlorine bleaching, a new process recycles spent sulfuric acid to the chlorine dioxide generator, thus removing sulfuric acid from the waste stream and lowering sulfuric acid consumption. Additional research is being carried out. waste stream and towering suiture acte consump-tion. Additional research is being carried out in-volving various combinations of chlorine perox-ide, dioxide, and monoxide as bleaching agents. (Anderson-Texas)

WATER RECLAMATION FROM SEWAGE EF-FLUENT: EXPERIMENTAL STUDIES IN ES-SEX, J. G. Slack.

Journal of the Society for Water Treatment and Examination, Vol 21, No 3, p 239-257, 1972. 8 fig,

Descriptors: *Waste water treatment, *Coagula-tion, *Flocculation, Filtration, Activated carbon, Waste treatment, Separation techniques, Bacteria, Viruses, Sewage treatment, Laboratory tests,

Water quality control, Water pollution control, Water reuse. Identifiers: *Essex Water Co. (UK).

An effective way of precipitating phosphate and adsorbing dissolved organic compounds is through the addition of a coagulant with powdered activated carbon as shown in laboratory tests on the chemical treatment of sewage effluent. Tests in a full-scale plant confirmed the laboratory results. The carbon particles are flocculated and a hydraulically stable upflow system easily established at a velocity of 0.5 mm/s. included the laboratory results. It is a property to laboratory results in the laboratory results in the laboratory results in the laboratory results a velocity of 0.5 mm/s. The coagulation and flocculation processes appear to be improved by the carbon and its adsorptive properties are not significantly reduced by inclusion in the floc particles. A substantial reduction is achieved in bacteria and viruses. (Smith-Texas)

THE MICROBIAL ECOLOGY OF A LUBECK ACTIVATED SLUBGE FLANT, University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Microbiology. B. L. Austin, and C. F. Forster. Water and Waste Treatment, Vol 12, p 208-210,

May/June, 1969. 4 tab, 10 ref.

Descriptors: "Waste water treatment, "Waste treatment, "Treatment facilities, "Activated studge, Sludge treatment, Algae, Bacteria, Aeto-pobic bacteria, Sphaerotilus, Water pollution control, Water quality control, Enteric bacteria. Identifiers: "Lubeck pilot plant.

In the period immediately after the recommissioning of the Lubeck plant the organisms in the aeration tank were mainly aerobic bacteria of intestinal origin and algae. When the plant was operating in a trouble free manner the bacterial population changed to one of mainly soil and water origin. The algae disappeared. Sphaerotilus natans were present in bulk sludges. The number of viable bacteria in the sludge remained relatively constant irrespective of the settling characteristics of the sludge. (Smith-Texas)

THE EFFECTS OF THE DISCHARGE OF SECONDARILY TREATED SEWAGE EFFLUENT INTO THE EVERGLADES ECOSYSTEM.

Miami Univ., Fla. For primary bibliographic entry see Field 05C. W73-07475

ENVIRONMENTAL ASPECTS OF COOLING TOWER PLUMES, ITT Research Inst., Chicago, Ill.

E. Aynsley. Paper presented at Cooling Tower Institute Meeting, January 26-28, 1970, New Orleans, Cooling Tower Institute TP 78A, Houston, Texas, 1970. 10

Descriptors: *Environment, *Cooling towers, *Electric power production, Efficiencies, Humidity, Meteorology, Fog. Ice, Clouds, Winds, Sulfur compounds, Thermal pollution, Waste treatment. Identifiers: *Natural draft tower.

Natural draft towers are becoming increasingly popular within the electrical generating industry, causing, as a result of the thermodynamic inefficiency compared to mechanical draft towers, the necessity to dispose of vast amounts of low grade heat. There were 16 natural draft towers in opera heat. There were 16 natural draft towers an opera-tion at the end of 1969 and current projections in-dicate 33 towers within the next two years. Keystone Generating Plant is an 1800 MW mine mouth coal-fired power station having four 325 ft hyperbolic towers and two 800 ft chimney stacks. It appears that hyperbolic tower plumes puncture and ventilate natural inversions and attain greater heights than mechanical draft tower plumes. It is estimated that an increase of 27% in local evaporation due to tower operation can occur in the Keystone area. This station burns up to 600 tons per hour of coal which gives rise to some 20 tons per hour of sulfur dioxide emitted in the stack gases. Merging of the tower and chimney stack plumes is a frequent occurrence, causing an increase in the rate of oxidation of sulfur dioxide to sulfuric acid. This oxidation rate is enhanced not only by the trace catalvitic constituents of fly sah only by the trace catalytic constituents of fly ash but also by increased humidity. (Upadhyaya-Van-derbilt) W73-07478

DESIGNING OPTIMUM COOLING SYSTEMS, GKN Birwelco Ltd., Birmingham (England).

Chemical Engineering, Vol 78, No 18, p 95-102, August, 1971, 10 fig.

Descriptors: *Cooling towers, *Economic efficiency, *Cooling, *Optimization, Chemistry, Equipment, Heat exchangers, Plumbing, Benefits, Costs, Planning, Cost analysis, Cost comparisons, Design, Temperature, Systems analysis

The economics of various types of cooling systems are discussed. The advantages and disad-vantages of air cooling, water cooling by shell and tube interchange, a combination of these methods in series, closed circuit water cooling followed by air cooling of water and humidified air cooling are discussed. This discussion is based upon a list of ten parameters which have a critical effect on the cost of any type of system. An examination of the optimization of returns from shell-and-tube equipment and cooling-tower and shell-and-tube com-binations is presented which encompasses many points which should be considered in the planning of a cooling system. Major emphasis is placed upon the determination of the temperature rise and the effect of expected temperaturerise upon instal-lation and operation costs. (Jerome-Vanderbilt)

DRY COOLING TOWERS FOR STEAM ELEC-TRIC POWER PLANTS IN ARID REGIONS, Pacific Northwest Water Lab., Corvallis, Oreg

M. A. Shirazi. Water Research, Vol 6, p 1309-1319, 1972. 4 fig, 3 tab, 10 ref.

Descriptors: *Cooling towers, *Thermal power-plants, *Arid lands, Evaporation, Thermal pollution, Powerplants, Electric power demand, Cooling, Heated water, Steam turbines, Fuels.
Identifiers: *Dry cooling towers, Natural draft,

In arid regions of the world, including the Western United States, the disposal of waste heat by evaporative cooling towers and cooling ponds in-fringes further on the environment by depleting valuable water resources. For example, the water loss from an evaporative cooling system for a 1000-MW plant ranges from 10,000 to 30,000 acreflyear. Dry-type cooling systems overcome both of these environmental problems but at an increased cost as compared with conventional evaporative cooling methods. With respect to the application of dry cooling towers to power plants, operating and design experiences have been gained in Europe with Heller-type natural draft systems and direct condensing mechanical draft systems. Dry cooling tower systems are optimized and costed for six steam electric power plants located in the Middle Eastern countries. No attempt is made to establish the present or future energy needs. (Oleszkiewicz-Vanderbilt) W73-07490

Group 5D—Waste Treatment Processes

ADSORPTION OF AROMATIC SOLUTES FROM AQUEOUS SOLUTIONS ONTO HYDROPHOBIC SURFACES, Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Chemistry.
L. R. Dole.

Ph D Thesis, August 1972. 192 p, 54 fig, 32 tab, 133 ref, 2 append. OWRR A-026-VA (3).

Descriptors: "Water treatment, "Sewage treatment, Methodology, Testing procedures, Adsorption, Chemical properties, Water chemistry, Phenols, Nitrogen, Plastics, Polymers, Reviews, Evaluation, "Waste water treatment.

The fundamental basis of this work is the role of hydrophobic surfaces in the adsorption of organic compounds from aqueous solutions and the practi-cal basis is tertiary water treatment. The study cal basis is tertiary water treatment. The study characterizes the adsorption of phenol, p-nitrophenol and nitrobenzene on Teflon 6, polyethylene and Nylon 6 and compares these results to the adsorption of these same compounds on two well documented surfaces: Graphon and Cab-O-Sil. Graphon is a highly uniform, hydrophobic, graphitized carbon black. Cab-O-Sil is a flame formed silica which has both hydropholic and hydropholic surface sites of a known bic and hydrophilic surface sites of a known geometrical distribution. A major emphasis is the recognized need for experience with polymer surfaces as absorbents in aqueous solution. The solu-tion adsorption experiments involved placing solu-tions of known concentrations in contact with a known weight of solid powder and measuring the final concentration at equilibrium. (Woodard-TISGS)

TRICKLING FILTER EXPERIMENT FOR PU-RIFICATION OF ANTIBIOTIC-CONTAINING HOSPITAL SEWAGE, National Inst. of Public Health, Budapest (Hunga-

ry).
M. Csanady, and Z. Deak.
Water Research, Vol 6, No 12, p 1541-1547,
November 1972. 5 tab, 6 ref.

Descriptors: *Biological treatment, *Sewage effluents, *Hospitals, *Efficiencies, *Waste water treatment, Antibiotics (Pesticides), Trickling filters, Sewage bacteria, Inhibition, Biochemical oxygen demand, Clostridium, Organic matter.
Identifiers: Streptomycin, Hungary.

The purpose was to determine whether antibiotics in hospital sewage inhibit biological treatment by trickling filters. Preliminary investigations of sewage treatment in tuberculosis sanitoria with trickling filters showed that in most cases purificatricking filters showed that in most cases purifica-tion efficiency was not satisfactory but that some technical deficiency existed in every case. For establishing efficiency of treatment 12 parameters were used. Organic matter was determined by the acid permanganate method. BOD5, coli and bac-terial counts (at 20 degrees and 37 degrees C), and terial counts (at 20 degrees and 37 degrees C), and Clostridium numbers were also determined. The antibiotic effect, i.e., streptomycin concentration, of sewage was determined microbiologically (Kavanagh, 1963). Experiments were performed at a tuberculosis-sanitorium where a small, separate trickling filter was operating. At the time of the experiment the treatment plant was operated and loaded as usual, and its treatment efficiency was satisfactory. The plant was loaded by sewage of 64 patients and 28 personnel; drug use in the dispensivy was precisely registered throughout the experiment. Experiments were carried out under the following operating conditions: streptomycin was fed to the settled sewage in 6 and 12 g/cu m doses settled sewage in 6 and 12 g/cu m doses ted to the settled sewage in 6 and 12 g/cm mooses for 7 and 3 days, respectively, expressed as active streptomycin base. Streptomycin in a concentration of 6-7 mg/l did not affect the operation of the lowload trickling filter. As this concentration is at least 6-8 times as high as that of tuberculosis-sanaroira sewages, it is concluded that inhibition of purification by such antibiotics does not occur. At a

concentration of 12 mg/l, streptomycin adversely affected the performance of the trickling filter by moderately decreasing the efficiency of organic matter removal and considerably reducing its efficiency in removing bacteria. Antibiotics in sewers in unregulated and high concentration may thus disturb treatment of the sewage. (Holoman-Battelle) W73-07581

TREATMENT OF EFFLUENT FROM MANU-FACTURE OF CHLORINATED PESTICIDES
WITH A SYNTHETIC, POLYMERIC ADSORBENT, AMBERLITE XAD-4,
Rohm and Haas Co., Philadelphia, Pa. Research

For primary bibliographic entry see Field 05G. W73-07587

CONFERENCE: POLLUTION OF THE IN-TERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN,-NEW YORK-V-

Federal Water Quality Administration, Washington, D.C. For primary bibliographic entry see Field 05G. W73-07697

STATE V. PUTNAM COUNTY DEVELOPMENT AUTHORITY (ISSUANCE OF MUNICIPAL REVENUE BONDS FOR CONSTRUCTION OF WASTE TREATMENT FACILITY).
For primary bibliographic entry see Field 06E.
W73-07717

AN EXPERIMENTAL STUDY OF THE AC-TIVATED SLUDGE PROCESS UNDER STEADY STATE AND DYNAMIC CONDITIONS, asas State Univ., Manhattan. Dept. of Chemical Eng incering.

M Sc. thesis, 1973, 85p, 18 fig, 9 tab, 19 ref, 2 append. OWRR A-029-KAN (6) and A-045-KAN (1), 14-31-0001-3016.

Descriptors: *Activated sludge, Dynamic Descriptors: "Activated sundge, Dynamics, "Biological treatment, "Sewage treatment, "Waste water treatment, Recycling, Waste disposal. Identifiers: "Experimental optimization, "Evolu-tionary operation, "Time constants, Transient response, Sludge wasting, Recycle flow, Adenosine tri-phosphate.

An experimental optimization of a step aeration An experimental optimization of a step aeration activated sludge system was carried out using evolutionary operation (EVOP). A laboratory-scale two-tank step aeration activated sludge unit was designed such that the total volume, total influent waste flow rate, recycle flow rate and sludge wasting rate were fixed. The volume ratio of 0.50 and the influent flow rate ratio of 0.50 and the sinfluent flow rate ratio of 0.50 and 0.50 an which gave a total COD removal of about 82% were found to be the optimal values of the decision variables. Evolutionary operation was useful in experimentally optimizing the operation of this biological waste treatment system. The transient behavior of a one-tank completely mixed activated sludge process was investigated experimentally. Step changes in the influent waste concentration, Step changes in the intinent waste concentration, the recycle flow rate and the sludge wasting rate were used to disturb the system. The responses of this system to step increases and step decreases for each of the disturbances were investigated. Time constants were estimated from the experime constants were estimated from the experimental data. The dry weight time constants were related to the sludge mean residence time; as the sludge wasting rate increased, the time constant decreased. The time constants of the dissolved COD in the aeration tank were much smaller than the sludge time constants, and were closely related to the fluid mean residence time in the aeration tank. W73-07720

METHOD AND APPARATUS FOR FILTERING

METHOD AND ALLQUID, Ecodyne Corp., Chicago, Ill. (assignee). A. Lindstol. U. S. Patent No. 3,701,423, 6 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 903, No 5, p 1581, October 31, 1972.

Descriptors: *Patents, Water treatment, *Liquid wastes, *Waste water treatment, Water quality control, Pollution abatement, Equipment, *Filtration, *Filters.

A method and the apparatus are described for fil-tering a liquid through a pair of filter beds arranged in series. Liquid to be filtered is first delivered into the enclosed chamber containing the first filter bed and the liquid is passed downward through it. The filtered liquid is then delivered to a backwash storage chamber above the first bed. It is then delivered to and passed downward through the second filter bed. Devices are provided for backwashing the first and second filter beds. The filter beds may also be gas-scoured. (Sinha-OEIS) W73-07736

OVERFLOW-TYPE FLOATING SKIMMER, Gulf Research and Development Co., Pittsburgh, Pa. (assignee). J. L. Henning, Jr., and W. J. Robicheaux. U. S. Patent No. 3,702,134, 3 p, 6 fig, 5 ref; Offi-cial Gazette of the United States Patent Office, Vol 904, No 1, p 41, November 7, 1972.

Descriptors: *Patents, *Oil pollution, Ponds, *Waste water treatment, *Skimming, *Liquid wastes, Industrial wastes, *Pollution abatement, Water pollution treatment, Water quality control.

A float-supported apparatus is described for removing oil from the surface of a settling pond. A skimmer delivers oil into an overflow conduit communicating with a counterbalancing duct of larger volume than the overflow conduit. The counterbalancing duct and overflow conduit. larger volume than the overflow conduit. The counterbalancing duct and overflow conduit are supported by a float at their juncture. A drain line that is flexible or provided with swing joints to allow vertical movements of the equipment discharges the liquid that enters through the skimmer. Liquid on backing up in the drain line enters the counterbalancing duct and causes pivoting of the overflow conduit to raise the level of the skimmer. (Sinha-OEIS)

REMOVAL OF MERCURY FROM EFFLUENT STREAMS.

Pennwalt Corp., Philadelphia, Pa. (assignee). P. F. Waltrich.

V. S. Patent No. 3,704,875, 3 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 905, No 1, p 107, December 5, 1972.

Descriptors: "Patents, Water pollution treatment, Pollution abatement, "Mercury, Metals, "Industrial wastes, Water quality control, "Distillation, "Waste water treatment.

The effluent stream is passed through a closed vessel having a bed of reactive metal particles, such as zinc, magnesium and aluminum, and iron, so that the mercury forms an amalgam on the metal surface. The vessel is subjected to a reduced pressure under relatively high vacuum conditions while the bed itself is heated. The mercury which is vaporized is condensed and recovered at an extremely high degree of purity because of the high vacuum distillation. Since regeneration is performed under vacuum, distillation occurs at lower temperatures than if done atmospherically. The absence of oxygen under vacuum conditions prevents oxidation and clumping of the reactive metal. The bed of reactive metal particles may be used and regenerated almost indefinitely. (Sinha-OEIS) W73-07738

SEWAGE TREATMENT SYSTEM. Ecodyne Corp., Chicago, Ill. (assignee).
B. L. Goodman, and R. B. Higgins.
U. S. Patent No. 3,704,788, 5 p. 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 905, No 1, p 86, December 5, 1972.

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Descriptors: *Patents, *Sewage treatment, Equipment, *Filtration, Gravity, Pollution abatement, *Waste water treatment, Water quality control. Identifiers: *Concentrator systems.

A concentrator system has a large diameter vacuum drum over which an endless filter media screen is trained. The endless screen has an overall length substantially greater than the circumference of the drum and is trained over an idle roller horizontally displaced from the drum. Solid containing liquid slurry or sludge is flowed onto the generally horizontal upper reach of the screen adjacent the roller by horizontal feed. As the screen carried the slurry or sludge away from the feed end, gravity filtering of liquid through the screen takes place. When the screen passes over the drum, vacuum de-watering further reduces the liquid coatent. (Sinha-OEIS) A concentrator system has a large diameter

APPARATUS FOR TREATING SEWAGE, Autotrol Corp., Glendale, Wis. (assignee). R. L. Antonie.

N. L. Antonie.
U. S. Patent No. 3,704,783, 6 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 905, No 1, p 85, December 5, 1972.

Descriptors: *Patents, *Aeration, *Waste water treatment, *Microorganisms, *Biological treatment, Dissolved oxygen, Equipment, Pollution abatement, Water quality control, *Sewage treat-

Completely submerged movable contactors, such as rotating disks, are used to provide biological treatment of waste water in a treatment tank. The tank has a circular horizontal cross section and includes two concentric annular sections. Partially submerged rotating disks provide aeration of the waste water. Aeration takes place in one annular section and clarification in the second section. Baffles are used to direct the waste water between the aeration section and the submerged assemblies where surfaces for attachment and growth of biomass of microorganisms takes place. (Sinha-OEIS) W73-07741

OIL TRANSPORTATION SYSTEM. For primary bibliographic entry see Field 05G. W73-07746

SEWAGE TREATMENT APPARATUS AND METHOD, G. W. Smith.
U. S. Patent No. 3,703,462, 5 p, 7 ref, 11 ref; Official Gazette of the United States Patent Office, Vol 904, No 3, p 389, November 21, 1972.

Descriptors: *Patents, *Sewage treatment, Treatment facilities, Aeration, Oxygenation, *Waste water treatment, Water quality control, Sludge.

A sewage liquor-air mixture is circulated through a hydraulic vertical flow circuit. The apparatus com-prises a rectangular tank of considerable depth prises a rectangular tank of considerable depth with baffle-like parts positioned below the normal liquid surface. These define flow passageways with aeration mechanisms, in one or more of the passageways introducing air and flow energy to the waste water. The treated sewage liquor is removed from the tank, the sludge is removed for recycling or disposal and the effluent water is clarified. (Sinha-OEIS) W73-07750 ELECTROLYTIC DESTRUCTION SEWAGE, Stellar Industries Ltd., Vancouver (British Colum-

Stellar Industries Ltu., vanchasta. bia), (assignee). J. Gordy, and D. R. Harris. U. S. Patent No. 3,703,453, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 904, No 3, p 387, November 21, 1972.

Descriptors: *Patents, *Waste water treatment, *Domestic wastes, *Industrial wastes, Sewage treatment, *Oxidation, *Electrolysis, Sulfates, Phosphates, Electrochemistry.

Waste material is destroyed by oxidizing it in an aqueous solution or slurry, in the presence of cuprous chloride-hydrochloric acid catalyst complex, in the anode compartment of an electrolytic cell. The anode and cathode compartments of the cell are separated by a porous membrane which prevents migration to the cathode of catalyst complex ions, cuprous ions, and suspended solids. If calcium oxide, or a soluble calcium salt is added to the mixture in the anode or catabode compartment, the reduction in the cathode compartment results in the precipitation of calcium phosphate, calcium sulfate, and other insoluble calcium salts. A salt solution in the cathode compartment of an electrolytic cell will form hydroxyl ions with a resulting increase in pH. If calcium chloride is used it will form insoluble phosphates and sulfates. (Sinha-OEIS) ha-OEIS) W73-07751

APPARATUS FOR THE BIOLOGICAL TREAT-MENT OF WASTEWATER,

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Aeration, Equipment, Treatment facilities, Pollution abatement, Water pollution.

Rotatable bodies are supported on horizontal shafts which are, in turn, mounted on bearings near the surface of the wastewater in the treatment tank. The bodies are partially immersed in the wastewater, and when rotated provide surface wastewater, and when rotated provide surface area that is alternately exposed to the atmosphere and to the wastewater. The pumping of the waste water along the surface of the tank by the action of rotating discs insures that all of the wastewater is brought into contact with the biological silmes in the disc surface so as to effect the removal of pollutants. Settled slime is removed from the lower portion of the tank. (Sinha-OEIS) W73-07753

LIMESTONE TREATMENT OF COAL MINE

DRAINAGE, Pennsylvania State Univ., University Park, Mine Drainage Research Section. H. L. Lovell.

Mining Congress Journal, Vol 57, p 28-34, October 1971. 7 fig, 1 tab, 14 ref.

Descriptors: "Acid mine drainage, "Coal mines, *Waste water treatment, "Limestone, "Sludge treatment, Aeration, Treatment facilities, Chemical reactions, Water pollution control, Waste disposal, Water quality control, Economics, Industrial wastes, Waste treatment, Mine drainage. Identifiers: "Limestone treatment.

Limestone treatment of coal mine drainage seems to be the most economical method yet proposed. The various impurities in mine drainage make the exact stoichiometry very complex, but physical screening of the surface of the limestone rocks seems to be the limiting factor. Rotary mill reactors keep fresh limestone exposed to the water, aerate the water, remove CO2, and control the

reaction time. Sludge dewatering is efficient, but the settled sludge has a clay-like consistency and is often difficult to handle. Excessive limestone fines may be generated by the rotary mill. (Anderson-Texas) 73-07786

WATER POLLUTION CONTROL PROGRAM, Armco Steel Corp., Middletown, Ohio. R. J. Thompson.

R. J. Thompson. Iron and Steel Engineer, Vol 49, No 8, p 43-48, August 1972. 6 fig, 1 tab.

Descriptors: "Waste water treatment, "Water treatment, "Water conservation, "Water pollution control, Water quality control, Water pollution sources, Waste disposal, Water pollution, Water utilization, Water supply, "Ohio. Identifiers: "Middletown (Ohio).

A recent expansion program at Middletown, Ohio, features 17 separate water conservation and water pollution control systems. Drastic reductions in water demand and waste discharges and the effective control of water pollution have resulted from this program. Three of the systems used are briefly described: (1) basic oxygen water systems, (2) hot mill water systems, and (3) pickler cold mill terminal waste treatment system. These three systems are examples of how wastewater quality has been upgraded to the point where water pollution is no longer a problem. (Smith-Texas) W73-d7787

FLOCCULANT TESTS, Esso Research and Engineering Co., Florham Park, N. J. R. R. Goodrich, Jr.

R. R. Goodrich, Jr.

Available from the National Technical Information Service as COM-72-10541. \$3.00 in paper
copy, \$0.95 in microfiche. Final Report on Task I,
Sub-Task 3 of Contract No. C-1-35049. Report
EE.1TMR.72, January, 1972. 60 p, 23 fig, 10 tab.

Descriptors: *Oily water, *Oil wastes, *Floccula-tion, Chemical reactions, *Waste water treatment, Oil pollution, Water pollution, Pollution abate-ment, Separation techniques. Identifiers: *Tankers, *Ship slop tanks, Chemical

Application methods and the effectiveness of utilizing chemical flocculants to enhance the normal gravity settling rates of crude oil dispersed in water on tankers are evaluated. Test programs have demonstrated that flocculant use aboard tankers can be effective in improving oilwater separation in a ships slop tank to the extent that the resultant water contains a low oil level. The degree of improvement depends on operating conditions such as tank cleaning techniques, voyage duration, crude type, solid residues and chemical application methods. No significant improvement in the separation process can be expected when chemicals are applied to oily water mixtures with and oil content less than 100 parts per million. Therefore, it is recommended that flocculant be considered as a method to enhance oil-water separation where high oil content levels are present. (Smith-Texas) W73-07789

IMPORTANCE OF CELL GROWTH RATE AND STOICHIOMETRY TO THE REMOVAL OF PHOSPHORUS FROM THE ACTIVATED SLUDGE PROCESS, Cornell Univ., Ithaca, N.Y. Dept. of Civil and Entire Process.

vironmental Engineering.
J. H. Sherrard, and E. D. Schroeder.

Water Research, Vol 6, p 1051-1057, 1972. 3 fig, 22

Descriptors: *Waste water treatment *Phosphorus, *Phosphates, *Sewage treatment Chemical reactions, Suspended solids, Precipita

Group 5D—Waste Treatment Processes

tion, Intensity, Biological treatment, *Growth rates, *Cytological studies, *Activated sludge.

Identifiers: *Waste water stoichiometry, Phosphorus removal.

Current theories of mechanisms of phosphorus removal from waste water have been discussed. removal from waste water nave been discussed.

The importance of cell growth rate, net solids production and waste water stoichiometry has been presented to clarify the matter in which phosphorus is removed biologically. Although high phosphorus removal is reported for sewages are most likely attributed to a precipitation phenomena, it was shown that phosphorus removal efficiency can be varied by controlling cell growth rate and the effectiveness of removal is dependent upon waste water stoichiometry. (Smith-Texas) W73-07793

ACTIVATED SLUDGE AND TRICKLING FILTRATION TREATMENT OF WHEY EF-

Quirk, Lawler and Hatusky, New York. T. P. Quirk, and J. Hellman.

Journal of the Water Pollution Control Federation, Vol 44, No 12, p 2277-2293, December 1972. 14 fig,

Descriptors: *Waste water treatment, *Trickling filters, *Activated sludge, *Design criteria, Industrial wastes, Aeration, Stabilization, Filtration, Dewatering, Sludge treatment, Waste treatment, Centrifugation, Odor, Suspended solids, Milk, Food processing industry, *Filtration. Identifiers: *Whey effluents, *Milk products.

A project was initiated to determine suitable treatment processes for whey effluents. A synthetic waste substrate was formulated for use in laboratory studies. The formula included whey, skim milk, waste water, and tap water and simulated the waste mixture expected for design. Studies were conducted of extended aeration activated sludge, aeration stabilization, contact stabilization, sludge dewatering, dissolved air flotation, centrifugation and filtration, laboratory scale trickling filter, odor control, solids separation, and sludge centrifugation. It was concluded that increased temperatu are beneficial for process performance, recircula-tion should be included only to insure adequate application velocities, filter sludge growth will be prolific, filter odors should not be offensive at low organic loadings required for high BOD removals, final sedimentation of filter effluent may require coagulation for production of a low solids effluent, secondary sludge can be thickened using gravity equipment and finally dewatering of secondary sludge can be accomplished by vacuum filtration. (Smith-Texas) W73-07796

EFFECTS OF ALUM ADDITION ON AC-TIVATED SLUDGE BIOTA, New Hampshire Water Supply and Pollution Con-

To Commission, Concord.
D. T. Anderson, and M. J. Hammer.
Water and Sewage Works, Vol 120, No 1, p 63-67,
January 1973. 2 fig, 2 tab, 6 ref.

Descriptors: *Aluminum, *Activated sludge, Pescriptors: "Atuminum, "Activated sludge, 'Sludge treatment, "Waste water treatment, Waste treatment, Biochemical oxygen demand, Municipal wastes, Treatment facilities, Laboratory ty tests, Biological treatment, Bacteria, "Biota. Identifiers: "Alum treatment.

The objectives were to define the influence of aluminum sulfate on microbial activity within the chemical-biological process and to evaluate treatability both of a municipal waste water and of soluble substrates. The results of laboratory experiments show that BOD removal is not significantly affected by addition of alum to the activated sludge unit. Higher life forms are adversely affected by alum to the extent that nearly a complete absence of viable protozoa exists with alum dosages in excess of 15 mg of alum!. It appears that chemical flocculation replaces the clarification role of protozoa in the settled effluent under these conditions. (Smith-Texas)

VIRUS REMOVAL FROM WASTE WATER USING OZONE,

USING OZUNE, Louisville Univ., Ky. J. L. Pavoni, M. E. Tittlebaum, H. T. Spencer, M. Fleischman, and C. Nebel. Water and Sewage Works, Vol 119, No 12, p 59-67, December 1972. 8 fig, 29 ref.

Descriptors: *Viruses, *Ozone, *Waste water treatment, *Waste treatment, Water treatment, Water pollution control, Water pollution control, Water pollution treatment, Treatment facilities, Viricides, Disinfection, Water reuse, *Tertiary dentifiers: *Ozone treatment

The purpose was to determine the effectiveness of ne as a viral disinfectant in secondary effluent waste water. Analytical procedures chosen for the experiment were sufficiently sensitive and specific experiment were sufficiently sensitive and specific for the scope of this investigation, but not so-phisticated to the point of being non-applicable to the waste water treatment field. Although complete viral disinfection was shown to occur after an ozone contact time of approximately 5 minutes, it was postulated that actual viral disin-fection text bears investment of the set her viral perfection took place instantaneously as the viral par-ticles passed over the ozone gas diffusers at the bottom of the first 2 reactor chambers. It was concluded that the viruses could be inactivated with virtually 100% efficiency after a contact time of 5 minutes at a total conce dosage of approximately 15 parts per million and a residual of 0.015 parts per million. (Smith-Texas) W73-07798

A STUDY OF HIGHWAY REST AREA WASTE WATER DISPOSAL.

Public Works, Vol 103, No 12, p 70-74, December 1972. 3 fig, 1 tab.

Descriptors: *Waste water treatment, *Water usage, Water supply, Sewage treatment, Treatment facilities, Design criteria, Highways, Highway beautification, Septic tanks, Drainage practices, Drainage systems, *Oregon, *Washing-

Identifiers: *Highway rest areas.

The problem of highway rest area waste water disposal was evaluated because increased usage is disposal was evaluated because increase usage is tending to aggreviate some of the operational problems and because plans are being made for many additional rest areas. Some operational problems include: (1) inadequate septic tank problems include: (1) inadequate septic tank capacity, (2) inadequate drain field capacity, (3) drain field failures, (4) pump motor failures, (5) clogging of septic tank tees, (6) undersized evaporation ponds, (7) peak usages difficult to anticipate, and (8) vandalism. A long list of tentative solutions is given based on data obtained through field triefs to work of the next west of the next w field visits to most of the rest areas in Washington State and several in Oregon. (Smith-Texas)

OXIDATION POND AS AN ADVANCED TREATMENT UNIT, J. M. Foulds.

Water and Sewage Works, Vol 119, No 12, p 56-58, December 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Waste water treatment, *Oxidation lagoons, *Design criteria, Water pollution control, Anaerobic treatment, Aerobic treatment, Aeraion, Sewage treatment, Biological treatment, Tertiary treatment, Cost analysis, Capital costs.

Identifiers: *Stabilization ponds.

Existing oxidation pond systems are illustrated and a possible future treatment unit for advanced waste treatment is developed. Design criteria are given and a table of construction costs and operating costs of this new advanced treatment system is included. (Smith-Texas)

5E. Ultimate Disposal of Wastes

A CALCULATION METHOD FOR DETERMIN-ING THE QUALITY OF SEA WATER POL-LUTED BY EFFLUENTS,

Tallin Polytechnic Inst. (USSR).
For primary bibliographic entry see Field 05B.
W73-07304

ENVIRONMENTAL IMPACT EVALUATION OF HAZARDOUS WASTE DISPOSAL IN LAND, Louisville Univ., Ky. For primary bibliographic entry see Field 05B. W73-07336

INDUSTRIAL WASTE DISPOSAL. Thermal Research and Engineering Corp., Conshohocken, Pa. For primary bibliographic entry see Field 05D. W73-07352

SUBSURFACE WASTE STORAGE-THE EARTH SCIENTIST'S DILEMMA,

Geological Survey, Denver, Colo. R. W. Stallman.

In: Underground Waste Management and Environmental Implications, Proceedings of Symposium held December 6-9, 1971, Houston, Texas, p 6-10, 20 ref.

Descriptors: Waste disposal, *Subsurface investigations, *Liquid wastes, Toxins, Groundwater, Subsidence, Permeability, Earthquake, *Environmental effects, Injection, Inorganic pesticides. Identifiers: *Subsurface waste storage, Mineral

resources.

Liquid wastes in unprecedented quantities are expected to be injected below the land surface because of recent stringent controls on disposal to streams. Some of the possible consequences of waste injection are (1) groundwater pollution, (2) waste injection are (1) groundwater poliution, (2) surfacewater pollution, (3) changes in rock permeability, (4) subsidence, (5) earthquakes, and (6) mineral-resource pollution. Although much work has been done to predict some of the effects, the current state of knowledge is not adequate to estimate them accurately. Theory regarding (a) dispersion, (b) nonlinear relations between rock stress and strain and (c) interrelations of budgets. suces and strain, and (c) interrelations of hydrau-lics, heat, chemistry, and rock mechanics at macroscale is especially deficient for application to the waste problem. Advances in the chemical thermodynamics and kinetics of geochemistry may provide improved technology. (Smith-NWWA) stress and strain, and (c) interrelations of hydrau-W73-07356

INJECTION WELLS AND OPERATIONS TODAY, Bureau of Mines, Bartlesville, Okla.

In: Underground Waste Management and Environmental Implications, Proceedings of Symposium held December 6-9, 1971, Houston, Texas, p 24-45. Il fig, 8 tab, 21 ref, append.

Descriptors: Injection, *Injection wells, Waste disposal, *Waste disposal wells, Industrial wastes, Sewage, Brines, Oil wastes, Organic wastes, Inorganic compounds, *Systems analysis.

Identifiers: *Subsurface waste storage, Inorganic

The feasibility and limitation of the underground injection of industrial wastes were investigated by observing installations at industrial plants, cities, and oil fields. The chemical industry is using about observing installations at industrial plants, cities, and oil fields. The chemical industry is using about 175 deep wells to inject approximately 30 million gal per day of waste solutions. The wastes are (1) inorganic salts, (2) mineral and organic acids, (3) basic solutions, (4) chlorinated and oxygenated hydrocarbons, and (5) municipal sewage. The wells, ranging from 1,000 to 8,000 ft (300-2,440 m) deep, are completed in three general types of formations: (1) unconsolidated sand, (2) consolidated sandstone, and (3) vagular carbonate rock. The chemical and physical characteristics of the formation and waste dictate the design of the injection system and govern its operation. Commonly, underground injection is the most economical method for disposal of liquid wastes that are not amenable to surface treatment. Operating costs are lower for pretreatment and subsurface disposal than for surface treatment systems, and plant area requirements are less. Chemical treatment is minimal, and generally the only physical treatment required for underground injection is filtration. (Campbell-NWWA)

OILY WASTE DISPOSAL BY SOIL CULTIVA-TION PROCESS, Shell Oil Co., Deer Park, Tex. Houston Lab. For primary bibliographic entry see Field 05B.

PRESSURE BEHAVIOR IN SUBSURFACE DISPOSAL OF LIQUID INDUSTRIAL WASTES, Mississippi State Univ., State College. C. H. Kuo

Journal Water Pollution Control Federation, Vol 44, No 12, p 2325-2333, December, 1972. 6 fig, 22

Descriptors: *Injection wells, *Waste disposal, *Ultimate disposal, Industrial wastes, Pressure head, Wells, Pressure, Mathematical models, Mathematical studies, Rock mechanics. Identifiers: *Hydraulic fracturing, *Mobility ratio.

Pressure distribution in the reservoir and pressure Pressure distribution in the reservoir and pressure buildup history at the well bore during deep well injection of wastes were investigated. A mathematical model has been formulated to describe transport behavior during injection of liquid industrial waste into a porous medium. The physical-temical properties of the injected liquid and the reservoir fluid are considered different. It was found that if the mobility of the injected waste is smaller than that of the formation fluid the pressure build un never enidty in the invaded zone and sure builds up very rapidly in the invaded zone and the pressure increase in the remainder of the formation is insignificant. Otherwise if the mobility ratio is larger than unity the pressure increases slowly across the invaded zone. The pressure increases at a very rapid rate during early injection at the well bore. This well pressure changes very little after a few years. (Smith-Texas) W73-07451

AN EXPERIMENTAL STUDY OF THE AC-TIVATED SLUDGE PROCESS UNDER STEADY STATE AND DYNAMIC CONDITIONS, asas State Univ., Manhattan. Dept. of Chemical Engineering. For primary bibliographic entry see Field 05D. W73-07720

EVALUATION OF THE CONCEPTS OF STOR-ING RADIOACTIVE WASTES IN BEDROCK BELOW THE SAVANNAH RIVER PLANT SITE. National Academy of Sciences, Washington, D.C. Committee on Radioactive Waste Management. For primary bibliographic entry see Field 05G.

W73-07766

RADIOACTIVE WASTE PROCESSING AND Technical Information Center (AEC), Oak Ridge,

For primary bibliographic entry see Field 05B.

DISPOSAL OF DIGESTED SLUDGE, West Hertfordshire Main Drainage Authority, Rickmansworth (England). R. Wood, and S. B. A. Ferris. Water Research, Vol 6, p 551-553, 1972. 1 tab.

Descriptors: *Sludge disposal, *Waste disposal, *Ultimate disposal, *Land reclamation, *Recycling, Transportation, Pumping, Waste storage, Fertilizers, Economics.
Identifiers: *Sludge transport, *Tank trucks.

The West Hertfordshire Main Drainage Authority conceived the land aludge disposal problem as a problem in transport and scheduling. A standard vehicle, available on a production line basis with cross-country capability was selected for sludge transport. Customer surveys established the basic scheduling and delivery constraints. The sludge can be pumped directly from the tank truck or deposited in pits for storage. Under the present system, sludge can be spread for eight out of the twelve months, soil conditions being unsuitable from December to March. (Anderson-Texas) W73-07788

A STUDY OF HIGHWAY REST AREA WASTE WATER DISPOSAL.
For primary bibliographic entry see Field 05D.
W73-07799

5F. Water Treatment and **Quality Alteration**

HYGIENIC EVALUATION OF THE MINERAL COMPOSITION OF DRINKING WATER OB-TAINED BY PARTIAL DESALINATION, Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 03A.
W73-07285

BORON CONCENTRATIONS IN DRINKING WATERS OF THE ARMENIAN SSR, Institute of General and Municipal Hygiene, Moscow (USSR). For primary bibliographic entry see Field 05B. W73-07299

RESISTANCE OF ENTEROCOCCI TO CHLORINE IN DISINFECTION AND PURIFICATION OF WATER IN WATERWORKS, RESISTANCE evo Waterworks, Moscow (USSR). I. N. Turchinskii.

N. Turchinskii.
 Available from the National Technical Informa-tion Service as part of TT70-50048/3, 33.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 7-9, p 121-123, July-Sep-tember, 1970. 2 tab. Trans from Gigiena i Sanitariya.

Descriptors: "Enteric bacteria, "E. coli, "Water pollution control, Water pollution sources, Water quality, Chlorination, Treatment facilities, "Water treatment, Clarification, Waste water treatment, Disinfection, Path of pollutants. Identifiers: "USSR, "Enterococci.

The resistance of enterococci to chlorine and conditions facilitating their preservation and entry to reservoirs for pure water were investigated. Studies of 90 water samples obtained from two

separate purifying installations yielded identical results. These results make it apparent that under certain conditions at waterworks, enterococci may not be destroyed by clarification and the disinfection of water with chlorine. One such condition is a high water turbidity of approximately 1 to 1.2 mg/l and higher for the collector reservoirs, when 0.35 to 0.45 mg/l residual chlorine destroys E. coil, but does not ensure the destruction of enterococci does not ensure the destruction of enterococci. (Smith-Texas) W73-07300

HYGIENIC EFFECTIVENESS OF THE SANITA-RY ZONE OF THE MOSCOW CANAL, Municipal Sanitary-Epidemiological municipal Sanitary-Epidemiological Cet Moscow (USSR). For primary bibliographic entry see Field 05G. W73-07306

CHARACTERISTICS OF COLIFORM BAC-TERIA ISOLATED FROM DRINKING WATER AND THEIR INDICATOR VALUE, Municipal Sanitary-Epidemiological Center, Zaporozhe (USSR). For primary bibliographic entry see Field 05B. W73-07308

THERMOPLASTIC PIPING FOR POTABLE WATER DISTRIBUTION SYSTEMS, National Research Council, Washington, D. C. Building Research Advisory Board.
For primary bibliographic entry see Field 08G. W73-07344

EVALUATION OF THE KENTUCKY WATER SUPPLY PROGRAM-SUMMARY, ental Protection Agency, Atlanta, Ga. Bureau of Water Hygiene.

Report 1972. 27 p 1 fig append.

Descriptors: Water supply, *Kentucky, Water quality control, Water pollution treatment, Water management (Applied), *Water purification, *Treatment facilities, *Water treatment, Distribution, Standards, Fluoridation. Identifiers: Bacteriology, *Surveillance (Water supply), Sanitary protection.

An evaluation was conducted to determine the effectiveness of the Kentucky Water Supply Program, and if necessary, to recommend such im-provements as may be needed to assure safe drink-ing water for the residents of Kentucky. It was concluded that the Kentucky Water Supply Program is not providing the health evaluation and enincering services necessary to fulfill its responsibilities to protect the health of the citizens of Kentucky omnoco or protect the nealth of the citizens of Kentucky. Well established standards of good practice are not being applied universally. A list of recommendations for upgrading the Kentucky Water Supply Program is given. (Smith-NWWA) W73-07348

MANUAL FOR EVALUATING PUBLIC DRINK-ING WATER SUPPLIES, A MANUAL OF PRAC-Environmental Protection Agency, Washington, D.C. Office of Water Programs

Reprinted 1971, formerly PHS Publication 1820, 1969. 62 p, 7 fig, append.

Descriptors: Water quality, *Treatment facilities, *Water supply, Turbidity, Hardness (Water), *Standards, Surveys, Water treatment, Disinfection, Coliforms, E. coli, Filtration, Chlorination, Fluoridation, Distribution systems. Identifiers: *Sanitary requirements, Chemical treatment

Group 5F-Water Treatment and Quality Alteration

Designed to provide guidance to health and water-works officials in determining whether a public drinking water supply satisfies modern health requirements, this manual replaces the Manual of Recommended Water Sanitation Practice. Origin, Recommended water Sanitation Practice. Origin, reatment, distribution, and storage of water, and the bacteriological, physical, chemical, and radiochemical qualities of the water as if flows from the tap are appraised in the evaluation of a public drinking water supply. Procedures for sur-veying and evaluating a water supply are recom-mended and elements of water treatment generally necessary to ensure the production of water that continuously meets the requirements of the Public Health Service Drinking Water Standards are described. Sanitary surveys to locate and identify health hazards which might exist in water supply systems are discussed. Recommended sanitary requirements given include factors for climate character of a supply's watershed, characteristics and volume of wastes entering the raw water supply source, and turbidity, color, alkalinity, hardness, iron, and bacterial quality of the raw water itself. (Smith-NWWA) W73-07350

SANITARY SURVEY OF DRINKING WATER SYSTEMS ON FEDERAL WATER RESOURCE DEVELOPMENTS.

Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Report. 1971. 50 p.

Descriptors: Water treatment, Water distribution (Applied), Surveys, Distribution systems, Coliforms, *Water quality, Cisterns, *Ohio, *Indiana, Reservoirs, *Water supply, Swimming, *Public health, Wells, *Water wells. Identifiers: Surveillance (Water quality), Hand

Results of a pilot study of water supply systems at reservoirs located in Ohio and Indiana lead to the reservoirs located in Omo and indiana lead to the following conclusions and recommendations: Sufficient health hazards and sanitary deficiencies were revealed to question the ability of a large number of these small water supply systems to constantly produce a safe, and satisfactory water. Deficiencies were revealed which could have been Deficiencies were revealed which could have been Detricencies were revealed which could have been avoided had the water supply system facilities been constructed, developed, and operated along established samitary standards and practices. To fully assess the ability of small Federal water supplies to produce safe water it was recommended that this study be extended to other Federally related small water systems in various geographical areas of the country. Also, the results of the study indicate the need for development of criteria and standards for the construction and operation of small public drinking water systems constructed with Federal funds, or under Federal supervision. It was further concluded that handpumped wells and cisterns be replaced wherever possible with power pumped well systems; that bacteriological and chemical sampling according to Public Health Service Drinking Water Standards be provided and that all distribution systems be continuously chlorinated; and finally, that operation and maintenance aspects be given a higher priority than in the past (Campbell-NWWA) W73-07351

COMMUNITY WATER SUPPLY STUDY-ANA-LYSIS OF NATIONAL SURVEY FINDINGS. Bureau of Water Hygiene, Cincinnati, Ohio.

Report, 1970. 111 p.

Descriptors: Water quality, Public utilities, Standards, *Water distribution (Applied), Coliforms, Pressure, Water consumption, *Water treatment, Turbidity, Iron, Manganese, Hydrogen sulfide, Potable water.

Identifiers: *Public water supplies.

A nationwide Community Water Supply Study was conducted during 1969 in eight geographically distributed Standard Metropolitan Statistical Areas and the State of Vermont. Only 59 percent of the systems studied delivered drinking water of the systems studied delivered drinking water that met the drinking water standards set up by the Public Health Service. An additional 25 percent of the systems delivered drinking water which exceeded recommended but not mandatory limits, and the final 16 percent delivered drinking water which exceeded mandatory limits. The smaller systems had more difficulty in meeting standards, particularly those systems serving less than 500 people. It was recommended that state or local regulatory agencies establish a policy of mandatory disinfection, that a chlorine residual be maintained in small water systems and that this residual be continuously monitored, that substances causing objectional appearance, taste or odor be eliminated as far as possible, and that pressure in distribution systems be monitored and adequate pumps and reservoirs be installed in low pressure systems. (Smith-NWWA) s studied delivered dri pumps and reservoirs be installed in low pressure systems. (Smith-NWWA) W73-07363

EVALUATION OF THE TENNESSEE WATER SUPPLY PROGRAM SUMMARY. Environmental Protection Agency, Atlanta Ga. Bureau of Water Hygiene.

Report, 1971, 23 p. 1 fig. 3 ref.

Descriptors: Water supply, *Tennessee, Water quality control, Water pollution treatment, Water management (Applied), *Water purification, *Treatment facilities, Water treatment, Distribution, Standards, Chlorination. Identifiers: Bacteriology, *Surveillance (Water supply), Sanitary protection.

A survey of the Tennessee Water Supply Program was conducted in order to determine the effectiveness of the program, and if necessary, to recommend such improvements as may have been needed. It was agreed that investigation of a representative number of water supplies was suffi-cient to judge the effectiveness of the program. A sample of public, 'semi-public,' and individual water supplies was selected for study. It was conwater supplies was selected for study. It was con-cluded that the Tennessee Water Supply Program was not providing the health evaluation and engineering services necessary to fulfill its responsi-bilities. It was found that well established standards of good practice were not being universally applied, and that there was a possibilty of repetition of past epidemics. It is stressed that Tennestion of past epidemics. It is stressed that Tennes-see must vigorously pursue an expanded drinking water program, giving increased attention to the broad problems of water supply. Specific recom-mendations include: water supply regulations be revised and expanded to more comprehensively reflect current recommended water supply prac-tice; drinking water supplies be improved to at least the minimum levels set forth in Public Health Drinking Water Standards and Manual for Evaluating Public Water Supplies. (Campbell-NWWA) NWWA) W73-07364

PUBLIC WATER SUPPLY TREATMENT TECHNOLOGY. American Water Works Association Research

Foundation, New York.

Available from the National Technical Informa-tion Service as PB-219 075, \$6.75 paper copy, \$0.95 in microfiche. Completion Report, 1973. 264 p, 5 fig. 4 tab, 254 ref, 2 append. OWRR X-111 (3418)(1).

Descriptors: "Research priorities, Technology, "Water treatment, "Reviews, "Water supply, Potable water, Water quality standars, "Bibliographies, Publication, Operations, "Water distribution (Applied), "Management. Identifiers: Water quality management.

A critical review is presented of operating practices, current problems, and research needs in the field of public water supply treatment technology. The study includes reports on resource, treatment, and distribution aspects. The intended audience is water utility management, including administrative, professional, and technical personnel having responsibility for day-to-day decisions on the quality aspects of water supply operations. The report (a) Delineates the management aspects of problems of public water supplies which affect the production of high-quality potable water and its delivery to consumer taps, (b) Analyzes and evaluates present operating practices, procedures and processes, (c) Describes presently known procedures and processes not currently widely applied, (d) Develops and defines recommendations for research which will provide the basic knowledge needed to improve process control, operation, management, and standards, and (e) Provides a selective bibliography of technical literature concerned with quality aspects of public water supply sources, treatment, and distribution. W73-07427

TREATMENT AND USE OF SLUDGE, Water Economics Research Inst., Warsaw (Po-land).

Paper presented at Seventh International Water Supply Congress and Exhibition, October 3-7, 1966, Barcelona, Spain, 16 p, 4 tab, 4 ref.

Descriptors: *Sludge disposal, *Water purifica-tion, *Water treatment, Sludge treatment, Coagu-lation, Waste water treatment, Water reuse, Recycling. Identifiers: *Alum sludge, *Poland, Vistula River.

Laboratory tests demonstrated the feasibility of Laboratory tests demonstrated the reasonary or regenerating alum sludge with sulfuric acid. River Vistula water was coagulated with 30-50 mg/l alum Al2 (SO4)3, the sludge was thickened for I hour, then mixed for 1 minute with 50% of the stoichiometric quanity of sulfuric acid, and filtered. A 50-60% recovery of the coagulant was obtained. Since the recovered coagulant alone failed to produce the desired results, a mixture of 25% new coagulant and 75% recovered coagulant was used to improve the sedimentation process. The fresh coagulant solution contained 10 g/l alum while the recovered alum solution contained 3.65 g/l, with both solutions having a pH of 3.95. The cost of recovering the coagulant was less than that of the new coagulant. (Taras-AWWA) W73-07444.

POTABLE WATER BACTERICIDE AGENT DEVELOPMENT, CHEMTRIC, Inc., Rosemont, Ill.

T. L. Hurley, and R. A. Bambenek

Available from the National Technical Informa-tion Service as N7228108, \$7.25 in paper copy \$0.95 in microfiche. Final Report 3097, September, 1972. 93 p., 14 fig., 16 tab. NASA-CR-115595.

Descriptors: "Water treatment, "Potable water, "Water supply, Laboratory tests, Research and development, Bacteria, Activated carbon, Ion exchange, Filtration, Biological treatment, Sampling, Analytical techniques.

Identifiers: "Silver chlorine, "Silver bromide,

Results are summarized of work performed for the development and evaluation of a bactericide agent system concept capable of being used in the Space Shuttle potable water system. This system doses Snuttle potable water system. Inits system doses fuel cell water with silver ions before the water is stored and used, by-passing this water through columns packed with silver chloride and silver bromide particles respectively. Results indicate that this concept is superior to the chlorine and iodine techniques used on Apollo. Further tests demonstrate that by heating the silver chloride

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

column to about 120 degree F as spore laden water column to about 120 degree F as spore laden water passed through the column, resulted in a death rate greater than a four-log change in concentration per day. Results of various tests indicated that some new design requirements for the Space Shuttle potable water system need to be determined. (Smith-Texas)

CONSERVATION OF WATER RESOURCES

CUNDERVATION OF WATER RESOURCES AND MANAGEMENT OF CATCHMENT AREAS IN UPLAND BRITAIN, University of New England, Armidale (Australia). For primary bibliographic entry see Field 05G. W73-07468

THE EFFECTS OF THE DISCHARGE OF SECONDARILY TREATED SEWAGE EF-FLUENT INTO THE EVERGLADES ECOSYSTEM. Miami Univ., Fla

For primary bibliographic entry see Field 05C. W73-07475

ADSORPTION OF AROMATIC SOLUTES FROM AQUEOUS SOLUTIONS ONTO HYDROPHOBIC SURFACES, Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Chemistry.
For primary bibliographic entry see Field 05D.

TRICKLING FILTER EXPERIMENT FOR PU-RIFICATION OF ANTIBIOTIC-CONTAINING HOSPITAL SEWAGE, National Inst. of Public Health, Budapest (Hunga-

ry). For primary bibliographic entry see Field 05D. W73-07581

VIRUS REMOVAL FROM WASTE WATER USING OZONE, Louisville Univ., Ky.

For primary bibliographic entry see Field 05D.

5G. Water Quality Control

REDUCING WATER POLLUTION FROM PULP MILL SULFITE WASTES, Michigan Technological Univ., Houghton. Dept.

of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-07155

A STUDY OF WATER RESOURCE PUBLIC DECISION MAKING, Cornell University, Ithaca, Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 06B. W73-07158

COMPUTER SIMULATION OF DESIGN CRITERIA FOR URBAN FLOW STORAGE SYSTEMS.

Hydrocomp International, Palo Alto, Calif. For primary bibliographic entry see Field 04A. W73-07163

LAKE GENEVA, WALWORTH COUNTY: AN INVENTORY WITH PLANNING RECOMMEN-

Wisconsin Dept. of Natural Resources, Madison. For primary bibliographic entry see Field 06B.

SEWERAGE AND WATER PLANNING RE-PORT (FOR) METROPOLITAN COUNCIL OF THE TWIN CITIES AREA, MINNESOTA. Metcalf and Eddy, Inc., Boston, Mass. For primary bibliographic entry see Field 05D. W73-07179

EFFECT OF IRRIGATION ON FERTILIZER NITROGEN IN ARABLE CLAY SOIL, Helsinki Univ. (Finland). Dept. of Agricultural

Chemistry. For primary bibliographic entry see Field 02G.

REOXYGENATION IN OPEN CHANNELS: DIF-

FUSION MECHANISM FUSION MECHANISM,
Politecnico di Torino (Italy). Instituto di Chimica
Industriale.
U. Fasoli, and S. Presbitero.

Water Research, Vol 6, No 12, p 1549-1556, 1972.

Descriptors: *Oxygenation, *Open channels, *Mathematical models, Diffusion, Mass transfer, Time, Velocity, Temperature, Resistance, Forecasting.
Identifiers: *Reoxygenation.

The phenomenon of reoxygenation of an open channel is the result of the overlap of two mechanisms: the transport of oxygen from outside to the inside of the fluid by diffusion and the consumption of oxygen owing to the oxidation of or-ganic substances by the loving mass. A mathemati-cal model has been formulated which explains experimental results and permits forecasts. It is important to have found such an interpretation through a model and to have defined the range of validity for this formulation. This model, from the vaninty for this formulation. Inis mode; from the mass transfer viewpoint, represents the case of a still layer of water, having infine breadth and a concentration at the starting time. Oxygen diffuses through the surface from the atmosphere into the inside in which the partial pressure corresponds to a concentration in the equilibrium curve. Using sliding co-ordinates, the same model is utilizable in unstitutional flow in a phasmal of infinite a unidirectional flow, in a channel of infinite breadth. The range of experimental conditions includes a sufficiently wide range of experimental condutions includes a sufficiently wide range of relocities and dimensions of channels, including laboratory flumes and natural rivers. The result is sufficient to justify the proposed mathematical model. (Jones-Wisconsin) W73-07201

WATER FOR NEVADA: FORECASTS FOR THE FUTURE -- MINING, Nevada Bureau of Mines and Geology, Reno. For primary bibliographic entry see Field 06D. W73-07246

ZONE MANAGEMENT FOR COASTAL DELAWARE.

For primary bibliographic entry see Field 02L. W73-07247

HYGIENIC EFFICACY OF CERTAIN MEA-SURES FOR THE SANITARY PROTECTION OF THE BELAYA RIVER,
Nauchno-Issledovatelskii Institut Gigieny i
Profzabolevanii, Ufa (USSR).

F. G. Murzakaev

F. G. Murzakaev. Available from the National Technical Informa-tion Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, No 10-12, p 24-245, October-December, 1970. 1 ref. Trans from Gigiena i

Descriptors: Water pollution, *Water pollution control, Water quality, *Water quality control, Industrial wastes, Waste water treatment, Waste

treatment, Effluents, Chemical industry, Pollution abatement, Toxicity, Cooling water, Oil wastes, *Water reuse, *Recycling. Identifiers: USSR, *Belaya River (USSR), *Petrochemical wastes, Oil refineries.

An investigation was conducted in a stretch of the Belaya River and its sanitary situation was found to be controlled by the following main factors: (1) the relatively low rate of flow of the river in the Salavat and Ishimbai areas; (2) the high concentration of industrial enterprises in the relatively small area; and (3) the large volume of industrial consumption of water from the Belaya River and the large quantity of effluents discharged into it. Measures have been taken to control the pollution of the Belaya River. For instance, the oil processing and petrochemical enterprises of the Salavat are now replacing their water cooled condensors with air coded ones. Certain petrochemical combines have raised the recycle ratio of water to 96%. Oil refineries, petrochemical and chemical works have recently been making extensive use of separate local purification of effluents in accordance with the nature of the pollutants. However, there is still a need for more intensive meacordance with the nature of the pollutants. How-ever, there is still a need for more intensive mea-sures, especially the use of technological processes aimed at sharp reductions in water con-sumption, the discharge of effluents, and the disposal of toxic products to the sewers. (Smith-Texas) W73-07288

ON THE FEASIBILITY OF COMPREHENSIVE UTILIZATION OF INDUSTRIAL AND DOMESTIC AND FECAL EFFLUENTS IN A MINING COMBINE,
Gosudarstvennyi Meditsinskii Institut, Orenburg

L. E. Olifson, E. N. Baltenko, O. V. Bukharin, and V. N. Pozhar.

Available from the National Technical Information Service as part of TT70-50048/4, \$3.00 in paper copy, \$0.95 in microfiche. Hygiene and Sanitation, Vol 35, Nos 10-12, p 412-413, October-December, 1970. Trans from Gigiena i Sanitariya.

Descriptors: *Acid mine drainage, *Water reuse, *Recycling, Alkalinity, Biological treatment, Industrial wastes, Research and development, Water quality control, Water pollution control, Pollutants, Disinfection, Waste water treatment. Identifiers: *USSR, *Orenburg region.

Much attention is paid to the recycling of water in Much attention is paid to the recycling of water in the utilization of effluents in the Gai Mining Com-bine in the Orenburg Region. At the present time, about half of the factories alkaline effluents are returned to flotation after standing in the tailings pond. Currently the alkaline effluents are diluted with pure water in the ratio of 1:1. The use of domestic and fecal effluents from the combine and settlement has been proposed for this purpose after complex biological purification and disinfec-tion. Experiments were conducted and the data show that the complete biological purification and chlorination of domestic and fecal effluents folchlorination of domestic and fecal effluents for-lowed by mixing with acid and alkaline waters in a ratio of at least 1:10 insures a reliable disinfecting effect provided they are left to stand for 2 weeks. Therefore, it is possible to consider their recycling in the ore dressing factory. (Smith-Texas)

HYGIENIC EFFECTIVENESS OF THE SANITA-RY ZONE OF THE MOSCOW CANAL, Municipal Sanitary-Epidemiological Center, Moscow (USSR).

A. E. Volkova.

A.E. VOIKOVA.

Available from the National Technical Informa-tion Service as part of TT70-50048/3, \$3.00 in paper copy, \$0.05 in microfiche. Hygiene and Sanitation, Vol 35, No 7-9, p 290-292, July-Sep-tember, 1970. 1 tab. Trans from Gigiena i

Group 5G-Water Quality Control

Descriptors: "Water supply, "Reservoirs, "Canals, "Canal design, Water pollution, Water quality control, "Pollution abatement, Sewage, Zoning, Public health. quality considered and considered an

The Moscow Waterworks received a large n water supply source with the construction of the Moscow Canal in 1937. At the same time the sanitary zone around the canal and reservoirs was demarcated and its sanitary conditions laid down including the following measures: prohibition of discharge of effluent even purified ones into the canal and the reservoir of the water-divide level; prohibition of construction in a 150 meter zone stretching along the entire course of the canal a the banks of the reservoirs which were assi the banks of the reservoirs which were assigned to green areas; vessels navigating the canal and reser-voirs were equipped with collectors for sewage, garbage, and bilge water. A chart illustrates the ef-fectiveness of the measures taken for the preven-tion of bacterial pollution of canal water and reservoirs. (Smith-Texas)

ON THE USE OF MINE WATERS FOR WATER

SUPPLY IN VORKUTA, Municipal Sanitary-Epidemiological Center, Vor-kuta (USSR). For primary bibliographic entry see Field 05D. W73-07307

WATER WELL STANDARDS: STATE OF

CALIFORNIA.
California State Dept. of Water Resources, Sacra For primary bibliographic entry see Field 08A. W73-07337

GROUND WATER QUALITY CONTROL. Michigan Dept. of Public Health, Lansing.

Act 294 P.A. 1965 and Rules, 1967. 21 p.

Descriptors: Wells, *Water wells, *Michigan, Regulation, *Legislation, Pumps, Installation, Ground water, *Water quality, Materials, Inspec-

Identifiers: Licensing, Registration, Definitions, *Statutes, Abandonment (Wells), Records.

The rules herein were adopted on November 23, 1966 by the Michigan Director of Public Health and became effective as ad ministrative rules on and became effective as ad ministrative rules on February 14, 1967, as published in Quarterly Sup-plement No. 49 to the 1954 Michigan Administra-tive Code. The rules cover private home water supplies and all other water supplies not specifi-cally covered under the following: Municipal, Community, or Central Water Supplies; and water supplies that serve persons other than the owner, supplies that serve persons other than the owner, for example: restaurants, motels, churches, schools, service stations, and other similar places of public assembly. Statutes are presented covering the following topics: Definitions, Licensing, Certificates of registration, Well drilling contractions: tors' and pump installers' examinations, Exemptions, Violations, Inspection, Advisory boards: members, appointment, geographic regions, terms of office, election of officers. Rules are also listed covering: Location of wells, Construction of wells including Grouting, Casings, Rotary bored or augered wells, and Artesian wells, Pumping equip-ment, Abandonment, and Pollution control. (Campbell-NWWA) W73-07339

RURAL WATER SUPPLY. New York State Dept. of Health, Albany For primary bibliographic entry see Field 04B. W73-07340

SUPPLY PROGRAM-SUMMARY, Environmental Protection Agency, Atlanta, Ga. Bureau of Water Hygiene. For primary bibliographic entry see Field 05F. W73-07348 EVALUATION OF THE KENTUCKY WATER

MANUAL FOR EVALUATING PUBLIC DRINK-ING WATER SUPPLIES, A MANUAL OF PRAC-

Environmental Protection Agency, Washington, D.C. Office of Water Programs. For primary bibliographic entry see Field 05F. W73-07350

SANITARY SURVEY OF DRINKING WATER SYSTEMS ON FEDERAL WATER RESOURCE DEVELOPMENTS.

Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05F.
W73-07351

COMMUNITY WATER SUPPLY STUDY-ANA-LYSIS OF NATIONAL SURVEY FINDINGS. Bureau of Water Hygiene, Cincinnati, Ohio. For primary bibliographic entry see Field 05F.

EVALUATION OF THE TENNESSEE WATER SUPPLY PROGRAM SUMMARY. ental Protection Agency, Atlanta Ga.

Bureau of Water Hygiene. For primary bibliographic entry see Field 05F. W73-07364

THE INTER-RELATIONSHIP OF WATER THE INTER-RELATIONSHIP OF WATER QUANTITY AND QUALITY AS A DETERMINANT OF WATER MANAGEMENT POLICY, MITRE Corp., McLean, Va. For primary bibliographic entry see Field 06B. W73-07368

BENEFICIAL MODIFICATIONS OF THE MARINE ENVIRONMENT. For primary bibliographic entry see Field 02L.

POSSIBLE TRANSFERS: EUTROPHICATION OF THE GREAT LAKES, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 02L.

W73-07398

LIMNOLOGICAL INVESTIGATIONS OF THE DANUBE RIVER (LIMNOLOGICHESKIYE ISS-LEDOVANIYA DUNAYA). Akademiya Nauk USSR, Kiev. Instytut

Akademiya Nauk Hidrobiologii. For primary bibliographic entry see Field 02E. W73-07413

WATER SUPPLY TREATMENT TECHNOLOGY. American Water Works Association Research

Foundation, New York.
For primary bibliographic entry see Field 05F.

REHABILITATION OF A BRINE-POLLUTED AQUIFER, Arkansas Div. of Soil and Water Resources, Little

For primary bibliographic entry see Field 05B. W73-07431

TRENDS OF THE WATER ECONOMY POLICY AGAINST THE BACKGROUND OF THE TASKS OF THE 5-YEAR PLAN OF 1971-1975, Water Economics Research Inst., Warsaw (Poland) ary bibliographic entry see Field 06B.

CONTROL OF OIL SPILLS, Texas A and M Univ., College Station. Coastal and Ocean Engineering Div. J. B. Herbich.

Available from the National Technical Informa-tion Service as COM-72-10810, \$3.00 in paper copy, \$0.95 in microfiche. C.O.E. Report No. 150, March, 1972, 37 p, 13 fig, 2 tab, 8 ref.

Descriptors: *Oil spills, *Oil wastes, Oil, Disasters, *Oil pollution, Water pollution, Waste water (Pollution), Waste water disposal, Water pollution control, Water quality control, Estuaries, Water pollution sources, Chemical reactions. Identifiers: Oil spill prevention, Oil spill containment of the policy

The report is divided into the following subdivi-sions: (1) prevention of oil from spilling, (2) con-tainment of oil at sea and in estuaries, (3) removal sions: (1) prevention of our from spining, (2) containment of oil at sea and in estuaries, (3) removal of oil from water surface, and (4) chemical treatment of oil in estuaries. Although the best method of controlling oil pollution is preventing the oil spill, if the spill should take place, there are two promising methods for containing the oil at sea: (1) a pneumatic barrier and (2) a mechanical barrier. Once the oil spill is contained, it can be removed in several ways: (1) by sweeping the surface of the water, (2) by using the Vortex principle, and (3) absorbing the oil from the water surface. Chemical treatment is also possible. The methods which could be employed include dispersants, floating absorbents, sinking agents, gelling agents, and burning agents. It is concluded that further research will eventaully permit oil spill containment and disposal under current, wave, and wind action in estuaries and at sea. (Smith-Texas)

BIOLOGICAL REMOVAL OF PHOSPHATES FROM WATER, Hach Chemical Co., Ames, Iowa. For primary bibliographic entry see Field 05D. W73-07449

FINAL REPORT OF PHASE I, DEVELOPMENT PROGRAM OF A CONTINUOUS REGENERAT-ING MOVING BED TO REMOVE OIL FROM

ING MOVING BED TO REMOVE OIL FROM OIL-WATER SUSPENSIONS, Hydronautics, Inc., Laurel, Md. F. E. Witmer, and A. Gollam. Available from the National Technical Information Service as COM-72-11041, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report 7080-1 October, 1971. 130 p, 42 fig, 20 ref.

Descriptors: *Oil wastes, *Oil spills, Filtration

Peterptors: On wastes, On spins, Fintauon, Filters, Separation techniques, Activated carbon, Plastics, Metals, Foam separation, Water pollution, Water pollution sources, Water pollution control, Water pollution treatment, Water quality control, Water reuse.

Identifiers: *Polyurethane foam, *Crude oil, *Oilwater separation

In order to develop a device for removing oil from oil-water ballast discharges, a series of commer-cially available candidate filter media were evaluated to determine their oil-water separation ated to determine their oil-water separation characteristics. Glass, porous ceramics, metals, wools, plastics, activated carbon, anthracite, fibrous non-woven mattings, and reticulated foams were investigated. It was found that a partially compacted bed of randomally oriented pieces of an open structured polyurethane foam does an excellent job of salvaging the wide variety

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

of oil contaminants including both crude and Bunker 'C' types. The resilient nature of this material facilitates reuse via simple expression of spent media. (Smith-Texas) W73-07459

WATER POLLUTION BY OIL. Institute of Petroleum, London (England).

Elsevier Publishing Co., Ltd., Amsterdam, London, New York, 223 p, 1968.

Descriptors: *Oil pollution, *Oil wastes, *Oil spills, Water pollution control, Water pollution sources, Legislation, Public health, Pipelines,

Storage tanks, Waste disposal.

Identifiers: "Refineries, "Tankers, Santa Barbara oil spill, Hamilton Trader Oil Spill, Oil disposal, "Oil toxicity.

A seminar sponsored by the Institute of Water Pollution Control and the Institute of Petroleum was lution Control and the Institute of Petroleum was held at Aviemore, Inverness-shire, Scotland to pinpoint certain legislative, administrative, and technical shortcomings involved in oil pollution. Papers were presented that detailed case histories of various oil spills, explored new methods of preventing water pollution from refineries, oil pipelines, and tankers, and also discussed disposal methods of used oil. Other papers were presented that examined the effect of oil pollution on aquatic life (Smith-Texas) life. (Smith-Texas)

WATER RECLAMATION FROM SEWAGE EF-FLUENT: EXPERIMENTAL STUDIES IN ES-

SEX, For primary bibliographic entry see Field 05D. W73-07467

CONSERVATION OF WATER RESOURCES AND MANAGEMENT OF CATCHMENT AREAS

AND MANAGEMENT OF CATCHMENT AREAS IN UPLAND BRITAIN, University of New England, Armidale (Australia). I. Douglas, and P. Crabb. Biological Conservation, Vol 4, No 2, p 109-116, January, 1972. 2 fig, 1 tab, 28 ref.

Descriptors: *Water supply, *Potable water, *Waste water treatment, *Water quality, *Recreational facilities, Water supply development, Water resources development, Agriculture, Water conservation, Water districts, Water control, Reser-Identifiers: *Scotland (Trossachs area).

Although the conservation of good quality water supplies to meet the growing demand from urban areas is necessary in the water supply catchment areas of upland Britain, much more flexibility is being introduced into the use and management of the gathering ground of upland reservoirs. An example of the conservation of a clean water supply together with the controlled use of agricultural ar orgener win the controlled use of agricultural and scenic resources of the area, is provided in the combination of sheep grazing, tourist facilities and water catchment protection in the Trossachs area of Scotland. The introduction of a more effective water treatment plant in Longdendale, near Manchester, has permitted greater recreational use of the reservoirs gathering grounds. Contrasts in management results from differing attitudes of the water supply authorities who all recognize the need for greater flexibility but are dominated by the demand for high quality water supplies. (Smith-Texas) W73-07468

OPEN SEA OIL SKIMMER,

C. W. Covey. Under Sea Technology, Vol 13, No 8, p 28-29, August, 1972. 1 fig, 2 ref.

Descriptors: *Oil spills, *Oil pollution, Oil wastes, Oceans, Ocean currests, Water pollution control, Water pollution sources, Water pollution treat-ment, Water pollution. Identifiers: *Oil recovery system.

Ocean Systems Inc., an affiliate of Union Carbide Corporation and the Singer Co. developed an oil receivery system for use by the Coast Guard. The equipment will recover oil from the open ocean surface at a rate of 2,000 gallons per minute with significant wave height up to 8 ft. and in currents up to 3 knots with less than 10% water in the recovered product. The entire system can be transrecovered product. The entire system can be transported by a C130B aircraft for rapid deployment to a spill site. (Smith-Texas)

NEW CRITERIA FOR FIRE PROTECTION OF LARGE AIR FORCE WAREHOUSES, VOLUME II, FRICTION LOSS IN PIPES: MINIMIZATION BY THE USE OF CHEMICAL ADDITIVES, Factory Mutual Research Corp., Norwood, Mass. Factory Mutual Research Corp., Norwood, Ma For primary bibliographic entry see Field 08B. W73-07474

ECOLOGY, ENERGY, AND ECONOMY Carrier Air Conditioning Co., Syracuse, N.Y. B. Morabito, and W. T. Lyons. Heating, Piping, Air Conditioning, Vol 44, No 2, p 51-57, February 1972. 3 fig. 1 tab.

Descriptors: "Air conditioning, "Temperature control, "Optimization, "Systems analysis, Cooling, Condensation, Cooling towers, Ducts, Refrigeration, Water cooling, Economics, Performance, Design, Heat transfer.

Energy conservation, ecological considerations and economic factors involved in planning air con-ditioning and refrigeration systems are discussed. ditioning and refrigeration systems are discussed.

Noise pollution is seen as the only pollution factor
of any consequence and it is felt that noise can
easily be reduced through careful location, use of
acoustic materials, and proper construction and
maintenance of the system. Another indirect form of pollution is the power requirements of a system which call for increases in power production in which call for increases in power production in local utilities. These power demands can be greatly reduced by careful consultation between architects, engineers, and equipment manufacturers in the selection of a system which can achieve optimum cooling and air conditioning efficiency. Systems which include cooling towers, low grade energy recovery devices, chilled water thermostats with low throttling ranges, and load/area controls are discussed. Careful consultation and design of an air conditioning and refrigeration system will result in lower noise levels, lower energy requirements, lower maintenance costs and nergy requirements, lower maintenance costs and nereased efficiency. (Jerome-Vanderbilt)

GEOTHERMAL SPURED ON BY 'POWERFUL MOTIVES', Union Oil Co. of California, Los Angeles. For primary bibliographic entry see Field 06D. W73-07488 ENERGY

A USER'S MANUAL FOR THREE-DIMENSIONAL HEATED SURFACE DISCHARGE COMPUTATIONS, isetts Inst. of Tech., Cambridge. Dept. of

Massachusering.
Civil Engineering.
For primary bibliographic entry see Field 05B.

TREATMENT OF EFFLUENT FROM MANU-FACTURE OF CHLORINATED PESTICIDES
WITH A SYNTHETIC, POLYMERIC ADSORBENT, AMBERLITE XAD-4,
Rohm and Haas Co., Philadelphia, Pa. Research D. C. Kennedy. Environmental Science and Technology, Vol 7, No 2, p 138-141, February 1973. 3 fig, 5 tab, 4 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Adsorption, *Industrial wastes, *Effluents, *Separation techniques, Activated carbon, Pollutant identification, Halogenated pesticides, Chemical analysis, Water pollution sources, Laboratory tests.
Identifiers: *Amberlite XAD-4, Adsorbents.

Laboratory experiments were conducted in order to devise a treatment method with specific application to industrial wastes streams which contain chlorinated pesticides. The use of the adsorbent Amberlite XAD-4 was evaluated in comparison with the widely used activated carbon. Chlorinated hydrocarbon pesticide effluent samples obtained from a pesticide manufacturer were analyzed by a technique involving a liquid-liquid extraction concentration step followed by electron capture gasiquid chromatography in order to characterize their content. Laboratory adsorption experiments were performed in 1.77-cm i.d. glass columns. A coarse glass frit in the bottom of the column was used to retain the adsorbent bed. Forty milliliters of adsorbent (ca. 32-cm bed depth) was used in used to retain the adsorbent bed. Forty milliliters of adsorbent (ca. 32-cm bed depth) was used in each experiment. Solutions were pumped through the column with a Hach variable flow piston pump. Column effluent samples were collected periodically and analyzed for total chlorinated pesticides. The leakage of unadsorbed pesticides from the XAD-4 column was significantly lower than that from the activated column. The adsorbed pesticides were efficiently desorbed from XAD-4 by eluting with isopropanol, but the activated carbon could not be regenerated effectively with isopropanol. (Holoman-Battelle) W73-07587

UNDERGROUND POLLUTION ANALYSIS AND CONTROL

Cincinnati Univ., Ohio. Div. of Water Resources. For primary bibliographic entry see Field 05B. W73-07614

CONTROL OF MESQUITE, University of the Panjab, Lahore (Pakistan). Dept. of Chemistry.
For primary bibliographic entry see Field 03B.
W73-07653

'WATER SYSTEMS,' COORDINATION PLAN AND DEVELOPMENT PROGRAM PHASE I -'WATER' SUPPLY 'SYSTEMS', WASTE 'WATER' POLLUTION CONTROL 'SYSTEMS', AND SURFACE 'WATER' DRAINAGE AND SURFACE Ellers, Reaves, Fanning and Oakley, Inc., Memphis, Tenn.

For primary bibliographic entry see Field 03D. W73-07690

WATER AND SEWERAGE STUDY, LEE COUN-TY, ALABAMA. Harmon, White and Associates, Inc., Opelika,

For primary bibliographic entry see Field 03D. W73-07691

APPLYING MODERN MANAGEMENT TECHNIQUES TO A WATER POLLUTION CONTROL PROGRAM, NEW YORK CITY, New York City Dept. of Public Works. Bureau of Water Pollution Control.

M. Lang, C. Samowitz, and M. Jethwani.

Journal of the Water Pollution Control Federation,
Vol 43, p 1807-1816, September, 1971. 12 fig., 3 tab.

Descriptors: "Management, "Administration, "Project planning, "Critical path method, "Water pollution control, Construction, Computers, Planning, New York.

Group 5G-Water Quality Control

Identifiers: *Management Information System.

The Bureau of Water Pollution Control within the New York City Environmental Protection Administration is using a computerized management information system (MIS) to help manage its treatment plant and sewer construction program. Since the New York State Pure Waters Bond Act of 1965, the MIS has proved to be a great aid. It uses the critial path method (CPM) to manage construction activities, and requires monthly data input sheets on construction progress to be fed to a central computer. The computer then prints out current status reports which are used in monthly briefing sessions within the Bureau. The MIS has produced notable accomplishments including earlier completion dates, more efficient use of personnel and equipment, better communication, and long-range planning activities. (Elfers - North Carolina)

CONFERENCE: POLLUTION OF THE INTERSTATE WATERS OF THE POTOMAC RIVER-WASHINGTON METROPOLITAN AREA, STATES OF MARYLAND AND VIRGINIA, AND THE DISTRICT OF COLUMBIA. Federal Water Quality Administration, Washington, D.C.

Proceedings of the Third Session (reconvened) of Conference in the Matter of the Interstate Waters of the Potomac River and Its Tributaries, 1970, Washington, D.C., 1970. 66 p., 4 photo, 4 chart.

Descriptors: *Potomac River, *Water pollution control, *Federal Water Pollution Control Act, *Interstate commissions, Maryland, Virginia, District of Columbia, Interstate rivers, Pollution abatement, Water pollution, Water pollution treatment, Water quality, Water quality control, Governmental interrelations.

The Conference met on October 13, 1970 to review a memorandum of understanding between Fairfax County, Virginia; the Washington Suburban Sanitary Commission, Maryland; and the District of Columbia Department of Sanitary Engineering, The memorandum detailed the actions that each of these parties will take to abate pollution of the Potomac River. The conferees unanimously came to the following agreements: (1) the memorandum of understanding was accepted by the conferees; the conferees recommend the Secretary of the Interior approve this memorandum; (2) at the next progress meeting the conferees will consider the coordination of time schedules for nitrogen removal facilities; and, (3) the conferees intend to meet at least four times a year to review progress against overall project schedules and also to review proposed actions to accommodate interim increase flows. (Wheeler-Florida)

CONFERENCE: POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN,-NEW YORK-V-ERMONT.

Federal Water Quality Administration, Washington, D.C.

Proceedings of the Second Session of the Conference in the Matter of Pollution of the Interstate Waters of Lake Champiain and Its Tributary Basin (New York and Vermont), 1970, Burlington, Vermont. 333 p, 19 fig, 13 map, 18 tab, 13 chart, 25 ref.

Descriptors: *New York, *Vermont, *Federal Water Pollution Control Act, *Water pollution control, *Water pollution sources, Water Quality Act, Water pollution, Water management (Applied), Waste treatment, Waste disposal, Water pollution treatment, Water quality, Water quality control, Impaired water quality, Law enforcement, Water pollution control, Regulation, Water policy, Mercury, Industrial wastes, Pollution abatement.

Identifiers: *Lake Champlain.

The second session of the Conference on Pollution of the Interstate Water of Lake Champlain and its Tributary Basin was held in Burlington, Vermont on November 13 and December 19 and 20, 1968. The sessions were initiated on the basis of a written request to the Secretary of the Interior from the Vermont Department of Water Resources. The Conference unaimously agreed that: (1) in accordance with the Water Quality Standards Implementation Plan, the pollution in Lake Champlain as the result of the discharge of untreated waste from the International Paper Company plant, shall be abated by July 1, 1970. (2) A technical committee shall investigate the sludge deposits in Lake Champlain in and adjacent to Ticonderoga Bay to determine the location and concentration of mercury. (3) The sludge deposits which have accumulated in Lake Champlain constitute (even after closing of the existing International Paper Company facility) pollution of interstate waters subject to abatement under Section 10 of the Federal Water Pollution Control Act, as amended. These sludge deposits emanate from New York State shall report to the conferees, no later than August 21, 1970, its program, including a time schedule to abate the interstate pollution caused by these sludge deposits. (Wheeler-Florida)

THE MINNESOTA ENVIRONMENTAL RIGHTS

Minnesota Law Review, Vol. 56, No. 4, p. 575-645, March, 1972.

Descriptors: *Minnesota, *Water pollution control, *Legislation, *Legal review, Air pollution, Administration, Permits, Water law, Law enforcement, State jurisdiction, Equity, Constitutional law, Environmental control, Environmental effects, Penalties (Legal), Conservation, Pollution abatement.

Identifiers: *Standing (Legal), *Citizen suits, Injunctions (Prohibitory), Nuisance (Legal aspects).

Prior to 1971, Minnesota citizens could effectively protect the environment only through a private muisance action; however, this was a burdensome remedy. In order to provide an adequate civil remedy to protect the state's natural resources from pollution, the Minnesota Environmental Rights Act was enacted, extending the ability of private entities to bring an action to protect the environment. The Act gives standing to any person or corporation residing within the state, as well as to the attorney general and any public subdivision of the state. There are four types of actions through which the environment can be protected: (1) action to enforce existing environmental quality standards, (2) action to enjoin conduct which materially adversely affects the environment, (3) action involving intervention into administrative proceedings or judicial review thereof where the conduct at issue is alleged to have caused pollution, and (4) action challenging the adequacy of state environmental quality standards or regulations. The Act gives courts considerable discretion in the area of remedies. Included is the text of the Act and a section-by-section analysis. By giving the judiciary more power to deal with environment almatters, the Act allows citizen initiative to play a more significant rule in the preservation of natural resources. (Adams-Florida)

BUFFALO NATIONAL RIVER, ARKANSAS. For primary bibliographic entry see Field 06E. W73-07700

ALEXANDRIA WATERFRONT. For primary bibliographic entry see Field 06E. W73-07701 ADMINISTRATION OF THE NATIONAL EN-VIRONMENTAL POLICY ACT, PART II.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402 \$3.50. Hearings-Subcomm. on Fisheries and Wildlife Conservation-Comm. on Merchant Marine and Fisheries, United States House of Representatives, 91st Cong, 2d Sess, December 1970. 822 p, 1 fig, 3 append.

Descriptors: "Administrative agencies, "Legislation, "Administrative decisions, "Decision making, Legal aspects, Permits, Regulation, Environmental effects, Constraints, Conservation, Federal government, Construction, Adjudication procedure, Control systems, Management, Government interrelations, Public health, Identifiers: "National Environmental Policy Act, "Environmental Impact Statements.

The subcommittee hearing appendices consist of selected materials relating to agency compliance with Section 102 (2) (c) of the National Environmental Policy Act of 1969, (NEPA). This section requires environmental impact statements. In the interest of encouraging informed public involvement in the process of developing agency procedures, the subcommittee has consolidated in this appendix a number of background documents dealing with this subject. The text of the NEPA and related Executive orders, guidelines issued by the Council on Environmental Quality and the Office of Management and Budget, pertinent memoranda, directories and correspondence are also included. The appendices also cover agency responses to Section 103 of the National Environmental Policy Act of 1969. (Smith-Adam-Florida) W73-07703

STATE OF MARYLAND, DEPARTMENT OF NATURAL RESOURCES V. AMERADA HESS CORPORATION (ACTION AGAINST POLLU-TOR OF BALTIMORE HARBOR). For primary bibliographic entry see Field 06E. W73-07708

WATER RESEARCH AND DEVELOPMENT. For primary bibliographic entry see Field 06E. W73-07710

WATERWAYS, DRAINAGE, FLOOD CONTROL, WATER POLLUTION AND WATER RESOURCES STUDY COMMISSION; WATER TERMINALS.
For primary bibliographic entry see Field 06E.

MAINTAINABILITY IN STATE COURT OF CLASS ACTION FOR RELIEF AGAINST AIR OR WATER POLLUTION, For primary bibliographic entry see Field 06E. W73-07713

UNITED STATES V. STANDARD OIL COM-PANY (DISCHARGE OF GASOLINE IN VIOLA-TION OF REFUSE ACT OF 1899). For primary bibliographic entry see Field 06E. W73-07718

ECOLOGICAL PERCEPTION: A STUDY OF ADOLESCENT AND PARENTAL ATTITUDES, North Carolina State Univ., Raleigh. Dept. of Sociology and Anthropology. For primary bibliographic entry see Field 06B. W73-07722

OVERFLOW-TYPE FLOATING SKIMMER, Gulf Research and Development Co., Pittsburgh, Pa. (assignee). For primary bibliographic entry see Field 05D. W73-07737

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

REMOVAL OF MERCURY FROM EFFLUENT

STREAMS, Pennwalt Corp., Philadelphia, Pa. (assignee). For primary bibliographic entry see Field 05D. W73-07738

FLOATING OIL SKIMMER, Union Oil Co. of California, Los Angeles. (as-

signer.
D. E. Craggs, and R. S. Gillen.
U. S. Patent No. 3,704,784, 5 p, 16 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 905, No 1, p 85, December 5, 1972.

Descriptors: *Patents, *Oil spills, Oil pollution, *Skimming, Oceans, Ecology, *Pollution abatement, Water pollution control, Water quality con-

Identifiers: *Oil skimmers

This floating skimmer comprises as elongated rectangular structure having imperforate side and rear walls and an imperforate bottom defining a partially enclosed, openfronted compartment. The bottom slopes downward from front to rear. A pivotable cutting lip is attached at the front edge of protable cutting up is attached at the front edge of the bottom. A vertical transverse weir is found near the rear of the compartment. An oil collection sump is found immediately to the rear of the weir. Oil free water is discharged through a transverse outlet opening in the bottom. Buoyant pontoons are attached at each end of the skimmer to render the apparatus buoyant. The pontoons may be detached to facilitate land transport. (Sinha-OEIS)

POLLUTION CONTAINMENT BARRIER. Esso Production Research Co., Linden, N.J. (as-

ngham, and L. D. Woody, Jr. U. S. Patent No. 3,702,657, 2 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 904, No 2, p 181-182, November 14, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Barriers, Equipment, *Water pollution treatment, Water quality control, Separation techniques.

This pollution containment barrier consists of a series of linked cages. Oil sorbent buoyant material held in each cage allows water to pass through the material while remaining oil wet. The spaces between the cages are closed off by impervious material. The cages are held in the submerged position by weighting. The pads of sorbent material may be removed and replaced by removing snaplatches or other lid arrangements. (Sinha-OETS) oeis) W73-07743

OIL SKIMMING DEVICE AND METHOD.

J. Maksim, Jr. U. S. Patent No. 3,702,297, 4 p, 6 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 904, No 1, p 81, November 7, 1972.

Descriptors: *Patents, *Skimming, *Oil spills, Oil pollution, Water pollution treatment, Water quality control, Equipment, *Pollution abatement, Separation techniques. Identifiers: *Oil skimmers.

The oil skimmer consists of an elongated collection roll having deformable surface capable of absorbing oil. The roll is mounted on a supporting structure which maintains the roll in contact with structure which maintains the roll in contact with the oil. The roll is tapered toward one end and is held so that its upper surface is inclined relative to the top of the oil layer. A wringer is placed against the lateral surface of the roll providing an elongated, downward sloping channel. As the collect roll rotates it absorbs oil. The wringer squeezes out the oil which has been absorbed. The oil is then delivered to a collection device. A doctor blade or a roller placed against the longitudinal surface of the wringer provides an inclined weir for the oil squeezed from the collection roll. An elongated baffle plate below the collection roll limits the amount of water taken up by the collection roll. A worm gear removes grease accumulations trapped worm gear removes grease accumulations by the doctor blade or roller. (Sinha-OEIS) W73-07744

SELF-PROPELLED FLOATING DOCK AND SEPARATOR FILTER ASSEMBLY FOR TREATING POLLUTED WATER SURFACES AND NAUTICAL WORKS,

L. Chastan-Bagnis. U. S. Patent No. 3,695,441, 3 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 903, No 1, p 152, October 3, 1972.

Descriptors: *Patents, *Oil pollution, Water pollution treatment, Water quality control, *Organic compounds, Equipment, *Pollution abatement, *Filtration, *Flotsam, Domestic wastes, Separation techniques.

Hydrocarbons.

A self-propelled floating dock and separation-filter assembly was designed for treating polluted water surfaces and nautical works. It consists of two longitudinal caissons, a bottom floor and transverse gradina cassons, a bottom into an example partitions. A door is mounted at the front end of the enclosure. The upper edge of the door can be placed at a predetermined depth under the water surface to enable polluted water to enter the enclosure. surface to enable polluted water to enter the enclosure. A motor is used to rotate a helix and create a strong current which moves the polluted water into the enclosure. The pollutant is separated by a filter within the enclosure and the water is caused to pass out through a special channel. Hydrocarbons or floating garbage may thus be removed. (Sinha-OEIS) W73-07745

OIL TRANSPORTATION SYSTEM,

B. T. Brown, and B. Stahmer.
U. S. Patent No. 3,702,744, 2 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 904, No 2, p 205, November 14, 1972.

Descriptors: *Patents, *Oil pollution, Transporta-tion, Water quality control, Equipment, *Pipelines, Rivers, *Pollution abatement.

At opposite ends of selected pipeline sections automatic valve arrangements are operable to shut off flow to and isolate the section in which a leak occurs. An accompanying arrangement provides for emptying that section of oil as fast as possible to minimize uncontrolled leakage into the river. (Sinha-OEIS) W73-07746

OIL BOOM WITH CONTINUOUS CONDUIT THERETHROUGH, Worthington Corp., Harrison, N.J. (assignee). W. C. Smith.

U. S. Patent No. 3,703,811, 5 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 904, No 4, p 482, November 28, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Water pollution treatment, Water quality control, Separation technique, *Pollution abatement. Identifiers: *Oil booms.

The oil boom is made of continuous flexible The oil boom is made of continuous flexible material which can be payed out to surround and contain an oil slick. This boom includes a continuous, inflatable hollow tube which constitutes a storage space for recovered oil and/or a transferring conduit therefor. Valves are selectively located along the length of the tubing to facilitate ingress and egress of the oil or other fluid pollutants. The boom has a weighted fin which keeps it in an upright position. It has a second fin to increase the buoyancy when the boom is carrying the collected pollutant. One or more boom lengths may be joined together in end to end relationship maintaining a continuous conduit running through its entire length. (Sinha-OEIS)

TREATMENT OF OIL SPILLS, Chevron Research Co., San Francisco, Calif. (as-

U. S. Patent No. 3,703,464, 3 p, 2 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 904, No 3, p 389, November 21, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution,
*Water pollution treatment, Water quality control,
Separation techniques, *Pollution abatement,
*Absorption. Identifiers: *Coconut husk.

Coconut husk material is spread on the oil spill to absorb it. The coconut husk material coagulates the film, keeps it from sinking, and forms a mass which is easily removed from fresh or salt water by mechanical means. Five test examples are cited. If the oil film is thin and there are many separate particles they can be pushed together into a mass by use of a chemical compression agent after being treated with the coconut husk material. (Sinha-OEIS)

SURFACE TENSION METHOD OF AND AP-PARATUS FOR SEPARATING IMMISCIBLE

LIQUIDS, TRW Inc., Redondo Beach, Calif. (assignee). P. G. Bhuta, R. L. Johnson, and D. J. Graham. U. S. Patent No. 3,703,463, 8 p. 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 904, No 3, p 389, November 21, 1972.

Descriptors: "Patents, "Oil pollution, Oceans, Lakes, Rivers, Liquid wastes, "Surface tension, "Separation techniques, "Pollution abatement, Water pollution control.

This method involves the use of a surface tension liquid separator containing a chamber bounded at least in part by a surface tension screen wall which is preferentially wetted by the selected liquid. The liquid separator chamber is filled with the selected liquid. iquid, such that the latter wets the screen. The outer side of the screen is placed in contact with the body of immiscible liquids. Each screen pore which is directly exposed to the second liquid in the liquid body contains a liquid-liquid interface whose interfacial surface tension resists passage whose interfacial surface tension resists passage of the latter liquid through the pore. Each screen pore which is exposed directly to the selected liquid is devoid of such a liquid interface. Passage of the selected liquid through the pore is not resisted by interfacial surface tension force. (Sinha-OEIS) W73-07749

BOOM SYSTEM FOR OIL CONTAINMENT, Massachusetts Inst. of Tech., Cambridge. (as-

signee.
J. B. Nugent.
U. S. Patent No. 3,703,084, 3 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 904, No 3, p 298, November 21, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Barriers, Waves (Water), Sea state, Currents (Water), "Pollution abatement, Water pollution treatment, "Water quality control, Equipment.

This boom system comprises a multiplicity of cells, open at top and bottom, interconnected to form a horizontal in-depth barrier or boom. The cells are constructed of membrane-like plastic

Group 5G-Water Quality Control

material and are designed to form pockets for the collection and containment of oil. The boom is coupled to a tether boom which is attached to receive to it weeker to be a second to be a mooring. Oil washed over the face of the boom or carried under it is trapped in the pockets or cells towards the top of which the horizontal velocity is considerably less than the current, despite the sea state or magnitude of the current. (Sinha-OEIS) W73-07754

OIL POLLUTION BARRIER,

O. Heartness.
U. S. Patent No 3,701,259, 6 p, 13 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 903, No 5, p 1541, October 31, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Oil wells, Barriers, *Water quality control, Water pollution control, *Pollution abatement, Equip-

Identifiers: Oil tankers, Water pollution preven-

This invention claims a method of laying a containment device, and provides for the construction of an oil pollution barrier to be used to confine oil spills which result from the rupture of lines in offshore oil wells, from accidents occurring in oil tankers, and from spills from waterfront oil equipment. A resilient barrier strip and sectioned inflatable hose are unreeled simultaneously and lowered into the water. Inflated pockets of the barrier strip cause the barrier to float. The sectioned hose which is attached below the edge of the barriers. ner strip cause the barrier to float. The sectioned hose which is attached below the edge of the barrier strip by means of the injection tubes creates a condition of low metacentric height or low center of gravity for the barrier as a whole, causing the barrier to float half submerged with its plane surface vertical to the water. When the slick is enclosed within the barrier the ends of the barrier strip and hose are cut and joined together. (Sinha-OEIS) W73-07755

EVALUATION OF THE CONCEPTS OF STOR-ING RADIOACTIVE WASTES IN BEDROCK BELOW THE SAVANNAH RIVER PLANT SITE. National Academy of Sciences, Washington, D.C. Committee on Radioactive Waste Management.

Available from NTIS, Springfield, Va., as TID-26166. \$3.25 per copy; microfiche \$0.95. Report TID-26166, 1972. 91 p, 6 fig, 3 tab, 11 ref, 8 ap-

Descriptors: "Radioactive waste disposal, "Waste disposal wells, "Waste storage, "Geologic formations, Geology, Hydrology, Geochemistry, Groundwater, Water pollution, Heat transfer, Dispersion, Ecology, Thermal properties, Safety factors, Structural stability, Public health, Rock properties properties.
Identifiers: *Bedrock, *Savannah River Plant Site.

The highly radioactive wastes aged in tanks at the Savannah River Plant (SRP) site must ultimately be transferred to some facility that offers effective retention for centuries. A solution under consideration is to store these wastes in vaults in the rocks deep beneath the site. For such long-term retention of radioactive wastes, an unprecedented degree of precise information is needed on the degree of precise information is needed on the hydrologic systems in the bedrock, on the regional stress fields, on the structural integrity of mined openings, and on the chemical compatibility between the wastes and potential host rocks. This needed degree of precision cannot be adequately obtained by exploration from the surface supplemented by a limited number of borings. Information from in situ exploration of the potential host rocks will be essential for development of an environmental-impact statement. Such in situ exploration is possible only by the construction of shaft to the proposed depth and the excavation of tunnels. (Houser-ORNL.) FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE FORKED RIVER NUCLEAR STATION UNIT 1.
Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va., as Docket 50363-47. \$3.00 per copp, \$0.95 microfiche. Report No. Docket No. 50363-47, Feb. 1973. 235 p, 19 fig, 25 tab, 80 ref, 4 append.

Descriptors: "New Jersey, "Nuclear powerplants, "Effluents, "Monitoring, "Environment, "Administrative agencies, "Comprehensive planning, "Hydrology, "Ecology, Sites, Geologic investigation, Seismology, Climatology, Meteorology, Radioactive wastes, Water pollution sources, Radioactivity effects, Transportation, Beneficial use, Cost-benefit analysis, Public health. Identifiers: "Environmental impact statements, Atomic Energy Commission, "Pressurized water reactor, "Barnegat Bay.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construc-tion of the Forked River Nuclear Station Unit 1. non of the Forace aver ruccear Statuto Unit.

Natural draft cooling towers will be used with
water coming from Barnegat Bay, Forked River,
New Jersey, Environmental impacts are assessed
and after consideration of alternatives an environmental benefit-cost summary was complied. Environmental factors considered include climate, vironmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded that the public health and the natural environs will not be endangered. No simplicant environmental in the puolic leading and the natural environs will not be endangered. No significant environmental im-pacts are anticipated. Some minor damage to cer-tain species of the aquatic environment is ex-pected. Therefroe, the action called for is the issuance of a construction permit subject to a recommended monitoring program and mitigation of any adverse effects found. (Houser-ORNL) W73-07765

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO CONSTRUCTION OF THE WM. H. ZIMMER NUCLEAR POWER STATION. Directorate of Licensing (AEC), Washington,

Available from NTIS, Springifield, Va., as Docket 50358-41. \$3.00 per copy, \$0.95 microfiche. Report No. Docket 50358-41, Sept. 1972. 291 p, 29 fig, 17 tab, 64 ref, 2 append.

Descriptors: "Nuclear powerplants, "Effluents, "Environment, "Administrative agencies, "Comprehensive planning, "Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Ohio, Ohio River

River.
Identifiers: Atomic Energy Commission, *Boiling water reactors, *Environmental Impact State

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Wm. H. Zimmer Nuclear Power Station on the Ohio River near Moscow, Ohio. The exhaust steam from the turbine will be cooled by haust steam from the turbine will be cooled by water circulated from a natural-draft cooling tower. Makeup water for the cooling tower will be taken from the Ohio River. Environmental impacts are assessed and after consideration of alterna-tives an environmental benefit-cost summary was compiled. Some of the environmental factors con-sidered include climate, hydrology (surface water and ground water), ecology including aquatic life,

cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved nd sanitary wastes, amount of dissolved d toxic chemicals in effluent water. The oxygen and toxic che oxygen and toxic chemicals in effluent water. The conclusion is to issue a construction permit for this facility subject to the following conditions: (1) earth work on shore to be carried out to minimize soil erosion; (2) maintain dust control during construction, (3) as soon as practicable seed and land-scape cleared areas; and (4) make preoperational measurements for baseline conditions to evaluate adverse effects of the station. (Houser-ORNL)

ENVIRONMENTAL RESEARCH LABORATO-RIES IN THE FEDERAL GOVERNMENT AN IN-

NIME FEDERAL GOVERNMENT AN IN-VENTORY, VOLUME I, Syracuse Univ. Research Corp., N.Y. Policy Inst. A. H. Teich, P. H. Howard, and L. Sumnicht. Available from NTIS, Springfield, Va., as PB-209 751; \$6.00 per copy, \$0.95 microfiche. Report, Sept. 1971. 472 p.

Descriptors: *Administrative agencies, *Organiza-tions, *Bibliography, *Census, *Administration, *Inter-agency cooperation, *Environment, *Research facilities, *Laboratories, Resources development, Environmental control, Environ-mental effects, Public health. Identifiers: *Directory, *Inventory

One purpose of this inventory is to make conveniently available the relevant information on capabilities of Federal laboratories. Also, a subntial effort is made to develop a statement of environmental research needs, with the eventual aim of comparing the capabilities represented in this inventory with those needs. An additional ob-jective of this inventory is the stimulation of closer ties between laboratories of diverse Federal agencies. Beyond these direct policy-related functions, this study hopes to be of value to students of Public Administration, Political Science, and Science Policy in a more traditional scholarly sense. It contains a wealth of data describing a cross-section of related research activities in widely differing administrative agencies and departments of the Federal Government. (Houser-ORNL) W73-07772

WATER POLLUTION CONTROL PROGRAM, Armoo Steel Corp., Middletown, Ohio. For primary bibliographic entry see Field 05D. W73-07787

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

REPORT OF RANGE SUBPROJECT, (FOR A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS),

Idaho Univ., Moscow. Water Resources Research

J. R. Herbst.

J. K. Herost.

Available from the National Technical Information Service as PB-218 683 \$3.00 in paper copy, \$0.95 in microfiche. Scenic Rivers Study, Report No 3, February 1973. 49 p, 3 tab, 14 ref, 6 maps. 14-31-001-3074, OWRR B-014-IDA (14).

Descriptors: *Wild Rivers, Methodology, *Range management, *Grazing, *Idaho, Forages, River basin development. Identifiers: *Salmon river basin (Ida).

The importance of grazing in the Salmon River Basin, and what implications a wild and scenic Basin, and what implications a wild and scenic river status would have on this activity are discussed. The first section deals with an inventory of livestock uses, grazing permits and animal unit month (s) (AUM) in the Salmon River Basin. The next section discusses the role of grazing, its relationship to potential classification of the river and competition of uses such as water quality, wildlife, forest, water resources and recreation. The discussion section concludes with possible restrictions on range use of the river if it was classified. Next a test case is given of the method used. Alternative classifications are presented, an inventory made, resource maps considered, alternative classifications identified and evaluated and conclusions drawn. It was estimated that there were about 2.7 million acres of forest land and 2.4 miltion acres of range land grazed in the Basin. The total AUM's on National Forest land were approximately 129,000 and on Bureau of Land Management (BLM) land 239,000 respectively. The total number of permittees reported were 583. The remainder of the report discusses the effects of classification and the relationships between recreation and livestock grazing. There doesn't seem to be much conflict between grazing and river classification. (Michalson-Idaho) discussed. The first section deals with an invento-

ECOLOGIC SIMULATION FOR AQUATIC EN-VIRONMENTS,

Water Resources Engineers, Inc., Walnut Creek,

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Calif.
C. W. Chen, and G. T. Orlob.
Available from the National Technical Information Service as PB-218 828, \$6.00 paper copy, \$0.95 in microfiche. Final Report, December 1972.
156 p. 33 fig. 17 tab, 38 ref, 2 append. OWRR C-2044 (No 3358) (1). 14-31-0001-3358.

Descriptors: "Water resources planning, "Water quality, "Eutrophication, "Lakes, "Reservoirs, "Estuaries, Mathematical models, "Simulation, "Nutrients, "Algae, Zooplankton, Fish, Dissolved oxygen, B.O.D., Temperature, pH, Benthic animals, Detritus, Carbon, Nitrogen, Phosphorus. Identifiers: "Lake Washington, San Francisco Bay, "Sacramento-San Joaquin Delta, "Seattle METRO.

A mathematical model for computer simulation of aquatic ecosystems was developed and adapted to lake and estuarial systems. The model is capable of simulating the annual cycle of ecologic successions involving algae, bacteria, zooplankton, fish and benthic animals and the interdependent relationships between biota and abiotic substances and benthic animals and the interdependent relationships between biota and abiotic substances carried in the natural aquatic system. It is water quality oriented, predicting the temporal and spatial distributions of temperature, dissolved oxygen, biochemical, oxygen demand, pH, conservative constituents (e.g., salinity, TDS, etc.), toxicity, nitrogen (three forms), carbon dioxide, and phosphorus as well as the biomass of each trophic level in the system. The basic formulations in the model are based on kinetic principles and the law of Conservation of Mass. Algal growth kinetics are governed by a Michaelis-Menton relationship including light, temperature, carbon, nitrogen and hosphorus. A demonstration of simulation capability of the Lake Ecologic Model was performed on Lake Washington using the data of W.T. Edmundson covering the periods 1962-63 and 1967-69 for comparison. The earlier period corresponded to a condition of incipient eutrophication and the latter period to recovery of the lake after diversion of waste water inflows. The model reproduced with fair reliability the major quality changes that were observed over the annual cycle in each of the two periods. A demonstration of the Estuary Ecologic Model was performed on the San Francisco Raw-Delas System using data eathered by the two periods. A demonstration of the Estuary Ecologic Model was performed on the San Francisco Bay-Delta System using data gathered by the University of California. The model simulated closely the actual response of the system. It was further tested for several alternative conditions of water quality control involving waste water treatment, relocation of outfalls and flow regulation.

DYNAMIC COMPUTER SIMULATION AND CONTROL METHODS FOR WATER DIS-TRIBUTION SYSTEMS, General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div. For primary bibliographic entry see Field 04A. W73-07165

WASTEWATER COLLECTION NETWORK DESIGN BY GEOMETRIC PROGRAMMING, Massachusetts Inst. of Tech., Cambridge. For primary bibliographic entry see Field 05D. W73-07365

EMERGING TOOLS IN GROUNDWATER MANAGEMENT, California Univ., Los Angeles. Dept. of Systems

Engineering.
For primary bibliographic entry see Field 04B.
W73-07366

MATHEMATICAL MODEL OF ANNUAL RU-NOFF FLUCTUATIONS FOR HYDROLOGIC AND WATER-MANAGEMENT CALCULA-

ary bibliographic entry see Field 04A.

SYSTEMS ANALYSIS: WHAT CAN IT DO. Camp, Dresser and McKee, Boston, Mass.

Water and Wastes Engineering, Vol 9, No 10, p 31-33, October, 1972. 4 fig.

Descriptors: *Water management (Applied), *Systems analysis, *Computers, *Alternative planning, Water supply, Benefits, Engineering, Design, Waste water treatment, Treatment facilities, Optimization, Simulation analysis, Model studies.

Identifiers: Cost minimization.

The role of systems analysis in water management planning is discussed. In general, systems analysis quantifies costs and other characteristics of the quantifies costs and other characteristics of the large number of design alternatives for a given project. It provides an impartial ranking of alternatives based on costs or system performance and determines how this ranking changes under a variety of circumstances. Without the use of this technique, and the computer, the costs in time and money to consider all the alternatives would be prohibitive. Although systems analysis can produce a least-cost solution, often this is not the ultimate answer to a given problem or set of produce a least-cost solution, often this is not the ultimate answer to a given problem or set of problems; and laternative system which provides significant nonquantifiable benefits-in terms of reliability, flexibility, or social and political considerationss-may be more desired. Several applications to water management planning problems are presented. (Bell-Cornell) W73-07369

CAPITAL-COST MINIMIZATION OF HYDRAU-

LIC NETWORK, Technische Hochschule, Karlsruhe (West Ger-many). Institut fur Siedlungswasserwirtschaft. For primary bibliographic entry see Field 04A. W73-07370

PLANNING AND UPDATING FARM IRRIGA-

TION SCEDULES,
Technion - Isreael Inst. of Tech., Haifa. Low-dermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-07371

PUBLIC WATER SUPPLY, Illinois Univ., Chicago. Dept. of Quantitative Methods.

For primary bibliographic entry see Field 06B.

W73-07373

OPTIMIZING PORTS THROUGH COMPUTER SIMULATION SENSITIVITY ANALYSIS OF PERTINENT PARAMETERS, Technical Univ. of Denmark, Copenhagen. Coastal Engineering Lab. For primary bibliographic entry see Field 04A. W73-07374

LEAST COST PIPE NETWORK DERIVATION, University Coll., London (England). Dept. of Civil and Municipal Engineering. For primary bibliographic entry see Field 04A. W73-07375

ECONOMIC EVALUATION WITHIN THE WATER INDUSTRY, Metropolitan Water Board, London (England). For primary bibliographic entry see Field 06B.

For primar W73-07376

HYDROLOGICAL RESERVOIR DESIGN USING

BASIC SYSTEMS THEORY TECHNIQUES, Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany). For primary bibliographic entry see Field 04A. W73-07377

SYSTEMS ANALYSIS AND IRRIGATION

Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 03F. W73-07378

THE USE OF SYSTEMS ANALYSIS IN WATER RESOURCES DEVELOPMENT.

Water Resources Journal, Economic Commission for Asia and the Far East, ST/ECAFE/SER.C/92, March, 1972. 6 p, 1 fig.

Descriptors: "Water resources development, "Systems analysis, "Operations research, "Op-timization, Mathematical models, Analytical techniques, Linear programming, Dynamic pro-gramming, Simulation analysis, Input-output anal-ysis, Project benefits, Computer programs, Con-

Identifiers: Network analysis, Nonlinear programming, Stochastic hydrology.

Systems analysis can assist operating agencies in planning more efficient and economic projects. An in-depth discussion of the use of systems analysis (operations research) in the development of water resources is presented. Current definitions are given, history and status are reported, and variables, constraints and the objective function in project planning are explained. The basic techniques of systems analysis are discussed and compared as to function and procedure: Linear programming, dynamic programming, simulation, network analysis, and nonlinear programming. Other advanced mathematical techniques that can improve the use of operations research techniques-input-output analysis and stochastic hydrology-are described. Possible applications of systems analysis include linear programming of systems analysis include linear programming of systems analysis include linear programming of multiple reservoir systems to achieve maximum output of water, power, or flood protection, and various studies for doing multiple-objective planning which require manipulation and analysis of innumerable data. To apply systems analysis, it is necessary to have a solid background in computer programming and use of modern high-speed computer hardware. (Bell-Cornell) Systems analysis can assist operating agencies in W73-07379

Field 06-WATER RESOURCES PLANNING

Group 6A—Techniques of Planning

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Informa-tion Service as PB-218 934, \$10.60 paper copy, \$0.95 in microfiche. WRSIC 72-219, December 1972. 406 p. edited by Daniel P. Loucks, Cornell University, Ithaca, New York.

Descriptors: "Systems analysis, "Bibliographies, "Optimization, "Simulation analysis, "Abstracts, Forecasting, Planning, Management, Operations research, Water resources.

An annotated bibliography of 289 references is presented of selected publications issued in 1971 pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. Two previous bibliographies having the same title were published by the Cornell University water Resources and Marine Sciences Center, Ithaca, New York (Publication 25, August 1969; Publication 35, June 1971). These three volumes include riew fork (reduction 25, August 1909; reducta-tion 35, June 1971). These three volumes include literature published through 1971. Both subject and author indexes are provided. Descriptors are listed with each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting in the planning and management of water resource systems. (See also W71-09465 and W70-00360). (OWRR)

SIMULATION OF WATER RESOURCES SYSTEMS WITH SPECIAL EMPHASIS ON GROUNDWATER.

For primary bibliographic entry see Field 02A. W73-07432

RAINFALL-RUNOFF COMPARISON OF MODELS FOR URBAN BASINS, Indian Inst. of Tech., Kanpur. For primary bibliographic entry see Field 02A. W73-07439

ON THE NEED FOR A SYSTEM OPTIMIZA-TION LABORATORY, Stanford Univ., Calif. Dept. of Operations Research

Research.

G. B. Dantzig, R. Cottle, B. C. Eaves, G. H.
Golub, and F. S. Hillier.
Available from the National Technical Information Service as AD-748 205, \$3.00 in paper copy,
\$0.95 in microfiche. Operations Research House \$0.95 in microfiche. Operations Research Hous Technical Report 72-11, June, 1972. 34 p, 110 ref.

Descriptors: *Comprehensive planning, *Optimization, *Computers, *Analytical techniques, *Laboratories, Model studies, Operations research, Linear programming.

Identifiers: Decomposition methods, Nonlinear programming, Matrix decomposition, Sparse matrix techniques, Complementarity methods, Integer programming.

Certain large-scale systems require total system planning, modeling, and optimization. Comprehensive optimization necessitates laboratories where a large number of test models, computer programs and special tools to aid in developing variants of existing techniques, are assembled in a systematic way. Society could benefit greatly if these certain total systems were modeled and successfully solved. For example, crude economic planning models of many developing countries indicate a potential growth rate of GNP of 10% to 15% per year; to implement such growth requires carefully planned, detailed models and computer programs that can solve the resulting large-scale systems. The world is also faced with difficult problems related to population growth, availability

of natural resources, ecological evaluation and control, urban redesign, design of large-scale engineering systems (e.g. atomic energy and recycling systems), and the modeling of man's physiological system for diagnosis and treatment; these complex, urgent problems can be solved only if viewed as total systems. A detailed discussion is presented of progress to date in comprehenomy a victor as total systems. A detailed discus-sion is presented of progress to date in comprehen-sive modeling of total systems, the various techniques that have been proposed, and the need to set up large-scale system optimization laborato-ries where the different techniques can be tested on representative problems. (Bell-Cornell) W73-07440

EVALUATING BENEFITS OF ENVIRONMEN-TAL RESOURCES WITH SPECIAL APPLICA-TION TO THE HELLS CANYON, Resources for the Future, Inc., Washington, D.C. Natural Environments Program. For primary bibliographic entry see Field 06B. W73-07441

CENTRALIZATION OF WASTE TREATMENT

Florida Technological Univ., Orlando. Environ-mental Systems Engineering Inst. For primary bibliographic entry see Field 05D. W73-07456

MATHEMATICAL MODELS AND THEIR USE IN WATER RESOURCES DECISION-MAKING,

Resources Research Centre, Ottawa (Omano).

A. K. Biswas.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of Intenational Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 241-248, 1972 (release date). 23 ref.

Descriptors: *Mathematical models, *Plann Water resources development, System analysis, Model studies, Reviews, Decision making, Canada, Simulation analysis.
Identifiers: St. John River system (Canada).

Use of mathematical models in the field of water Use of mathematical models in the field of water resources planning is not new; what is new is the current capability to analyze more complex systems. Mathematical modeling is a problem solving technique wherein attempts are made to build replicas of real world systems or situations. Basically, models can be divided into two categories: programing and descriptive. Programing Basically, models can be divided into two categories: programing and descriptive. Programing models derive the optimal policy for a given objective function, whereas descriptive models predict the values of endogenous variables for a given set of exogenous variables for a given set of exogenous variables. Models can significantly aid the decision maker to arrive at better decisions by broadening his information base, by predicting the consequences of several alternative courses of exiting the consequences of several alternative courses of exiting the consequences. the consequences of several alternative courses of action, or by selecting a suitable course of action which will accomplish a prescribed result. The fundamental aspect of any decision-making process is the participation of those who may be affected by the decision itself. The model builder can play an important part by informing the public of the several feasible alternative plans and their possible consequences. The public, fortified with this knowledge, can make better input in making meaningful decisions. Finally, the policy implications of the mathematical programing model and the simulation model developed for the St. John River System of Canada are dicussed. (Knapp-USGS) W73-07529

GREAT LAKES SIMULATION MODEL-A

DECISION AID,
Department of the Environment, Ottawa (Ontario). Water Management Service.
R. L. Pentland, D. F. Witherspoon, and G. W.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of Inter-national Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 249-255, 1972 (release date). 3 fig. 8 ref.

Descriptors: "Mathematical models, "Planning, "Great Lakes, "Simulation analysis, "Decision making, Systems analysis, Water resources development, Regulation, Forecasing, Water balance, Water levels.

The application of simulation and mathematical programing techniques to the problems involved in regulation of the Great Lakes is discussed. In particular, the use of forecasting as an aid in operational decision making and simulation techniques to test alternative reservoir operating policies are emphasized. Interrelationships between the various models and subsystems used are discussed. ous models and subsystems used are discussed. (Knapp-USGS) W73-07530

APPLICATION OF HYDROLOGIC SIMULA-

APPLICATION OF HYDROLOGIC SIMULA-TION TO WATER RESOURCES PLANNING, Hydrocomp International, Palo Alto, Calif. G. Fleming.
In: Hydraulic research and its impact on the en-vironment; Proceedings of 14th Congress of Inter-national Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 257-264, 1972 (release date). 7 fig, 18 ref.

Descriptors: *Mathematical models, *Planning, Water resources development, Systems analysis, Model studies, Reviews, Decision making, Simu-

The literature pertaining to computer applications in water resources and systems analysis techniques contains references to numerous methods for solving specific water resource problems. Few of these techniques go beyond the research stage and fewer can be generally applied. Current computer orientated techniques are reviewed with the critical viewpoint that they should be suitable for applied water resources planning and operation. This viewpoint is adopted because the progress of any research tool will be accelerated by applying it to the 'real' problem. Several examples show the successful application of one specific model to widely divergent aspects of applied water resources. These include flood forecasting, flood plain management, flood frequency, urban hydrology, and vegetation management. (Knapp-USGS) The literature pertaining to computer applications

STOCHASTIC ANALYSIS OF HYDROLOGIC Illinois Univ., Urbana. Hydrosystems Lab. For primary bibliographic entry see Field 02A. W73-07532

MODERN MANAGEMENT APPLYING APPLYING MODERN MANAGEMENT TECHNIQUES TO A WATER POLLUTION CONTROL PROGRAM, NEW YORK CITY, New York City Dept. of Public Works. Bureau of Water Pollution Control. For primary bibliographic entry see Field 05G.

6B. Evaluation Process

PUBLIC SERVICE AND THE PUBLIC UNIVER-SITY: ENVIRONMENTAL PROBLEM-SOL-VING AND RESEARCH, Massachusetts Univ., Amherst. Water Resources

Research Center.

J. R. Pease.

Available from the National Technical Information Service as PB-218 694, \$3.00 in paper copy,

\$0.95 in microfiche. Publication No 24, Completion Report No FY '72-9, January, 1971. 200 p, 53 ref, 3 append.

Descriptors: *Water resources development, *Planning, *Universities, Public benefits, Surveys, *Environment, *Water policy, Information exchange. Identifiers: *Problem solving, Public service, *Research planning.

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The question of how a land-grant university can best apply its resources to complex water resources problems is studied. The specific objectives were to develop set policies (1) to facilitate communications and cooperation between the University of Massachusetts and local, regional, communications and cooperation between the University of Massachusetts and local, regional, and state agencies concerning water resources problems; (2) to encourage intra-University cooperation on applied water resources problems, and (3) to further the application of university capabilities to water resources. The data base was obtained through literature sources, two survey questionnaires, and extensive personal interviews. Analysis of this data base leads to a set of general and specific recommendations. These recommendations include (1) the establishment of separate problem-solving action centers and systems research centers; (2) built-in faculty reward systems in public service programs; (3) long-term program funding commitments by state and Federal funding sources for both action and systems research activities; (4) communication links with other universities and colleges throughout the state; and (5) an Environmental Action Center to perform such activities as information dissemination, problem diagnosis and definition, study design, consulting, and problem-solving. (Settle-Wisconsin)

A STUDY OF WATER RESOURCE PUBLIC DECISION MAKING, Cornell University, Ithaca, Water Resources and Marine Sciences Center.
H. R. Capener, and J. R. Fialey.
Technical Report No 37, December 1971. 38 p, 1 fig. 2 tab. OWRR A-028-NY (1). 14-01-0001-3032, 14-31-0001-3232.

Descriptors: "Abatement, "Attitudes, "Political aspects, "River basin development, "Social participation, "Watersheds (Basins), Cost-benefit theory, Farm wastes, Local governments, Municipal wastes, On-site data collections, Project planning, Regional analysis, Reservoirs, Rural sociology, Water pollution sources, "New York. Identifiers: "Fall Creek watershed (NY), "Canadarago Lake watershed (NY).

*Canadarago Lake watershed (NY).

Phase I - Participation in Water Resource Planning: The objective was to identify and examine the factors affecting participation in water resource planning, and especially the participation on voluntary and professional groups. The research was accomplished through a series of open-ended interviews with leaders and key informants in the Davenport Center area of the Eastern Susquehanna River Basin. Four subsystems were identified as the contesting parties in the planning process. A typology was presented for identifying the predisposition and relative strengths of varying groups to provide a basis for assessment and action in strengthening appropriate group inputs. The groups themselves were examined with regard to strategies employed and variables related to participation. Phase II - A Study of Behavioral Components of Water Pollution Control in the Fall Creek and Canadarago Lake Watersheds: The objective was to determine relevant factors bearing upon water pollution control planning in a flowing stream watershed (Fall Creek) and a lake basin (Canadarago). On the basis of consultation with possible client groups (Cooperative Extension Service, County Board of Health and Department of Environmental Conservation) an interview mental Conservation) an interview

schedule was prepared and applied to a one-sixth sample in each watershed. Analysis is underway on the development of variables related to pollu-W73-07158

DECISION MAKING IN WATER RESOURCE INVESTMENT AND THE POTENTIAL OF MULTI-OBJECTIVE PLANNING: THE CASE OF THE ARMY CORPS OF ENGINEERS, Cornell Univ., Ithaca, N.Y.

Cornell Univ., Ithaca, N.Y.
L. A. Shabman.
Available from the National Technical Information Service as PB-218 814, \$6.75 in paper copy, \$0.95 in microfiche. Cornell University Water Resources and Marine Sciences Center, Technical Report 42, July, 1972. 204 p, 1 fig. 6 tab, 150 ref. OWRR-C-2199 and B-026-NY (2). 14-31-0001-3409;14-31-0001-3312.

Descriptors: *Decision making, Water resources, Projects, *Evaluation, *Economic efficiency, *Planning, *Investment; Regional development, Systems analysis, Mathematical models, Social aspects, Political aspects, Analysis, *Multiple-pur-

pose projects, Analysis, *Multiple-pur-pose projects.
Identifiers: *Multi-objective planning, *Army Corps of Engineers, Environmental quality, Social well-being.

well-being.

In the recent past, the principal measure of a water project's social worth has been its contribution to national economic efficiency a measured by the benefit-cost ratio. As a result, the benefit-cost ratio has come to represent more than economic efficiency. It often serves to legitimize a wide range of considerations believed to be a measure of project worth, but it has no formal mechanism for their analysis or evaluation. Proposals have recommended that formal emphasis on benefit-cost analysis as a primary condition for project justification give way to consideration of a wide range of criteria including, but not limited to, economic efficiency. Other evaluation objectives would be regional development, environmental quality, and social well-being. As a result, the feasibility of multiple-objective project evaluation (MOE) is being investigated. To provide a comprehensive understanding of the impact of MOE upon the planning process, the current decision-making process for the project construction program includes building of dams, reservoirs, leves, channels, breakwaters and jetties, as well as dredging operations to meet flood control, navigation, hydroelectric power, drainage, recreation, fish and wildlife conservation, water supply and water quality needs. A set of concepts useful for analysis of the political choice process is presented. (Bell-Cornell)

INVESTIGATION OF A NORTHEASTERN WISCONSIN LAKE ECOSYSTEM: AN INTER-DISCIPLINARY APPROACH. PHASE I - AP-PROACH AND PRELIMINARY SURVEY, Wisconsin Univ., Green Bay. For primary bibliographic entry see Field 02H. W73-07162

SOCIAL ASPECTS OF FLOODING IN THE UR-BANIZED EAST SALT LAKE COUNTY AREA, Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources. W. H. Andrews, W. C. Dunaway, and D. C.

Geertsen. Research Circular No 1, July 1972. 40 p, 6 fig, 1 tab, 42 ref, append. OWRR-A-010 UTAH (1), 14-31-0001-3845.

Descriptors: "Social values, "Aesthetics, "Flood damage, "Flood control, Channeling, Cloudbursts, Social aspects, Social impact, Decision making, Land use, Flood plain zoning, Flood frequency,

Parks, Recreation demand, Urban runoff, *Urban sociology, Floods, *Utah, Snowmelt, Urbanization.

Identifiers: *Vested interests. *Salt Lake County atifiers: *Vested interests, *Salt Lake County

(Utah).

Secondary data were used to identify social factors that affect flood control in the eastern half of Salt Lake County, Utah, which includes all of Salt Lake City. Social factors discussed are: (1) The efects of recreation on the watersheed of Salt Lake City and County. (2) The impact of a growing population on flood control facilities. (3) The aesthetic values held by people who build homes on steep mountain slopes and along casyon streams. (4) Socio-economic differences between residents living in the western portion of Salt Lake City along the Jordan River as compared to the more wealthy residents living on the eastern side of the city and county along the mountain slopes. (5) The part played by vested interests held by private and governmental contractors and agencies concerned with doing possible flood control work. Also discussed are physical factors related to flooding. The above mentioned social factors are discussed with regard to their impact on the two principal types of flooding in this area, i.e., cloudburst floods and snowmelt floods. A brief history of the development of the Salt Lake City area, including a history of flooding, is discussed. An abstract of newspaper articles on cloudburst floods that have occurred in the Salt Lake City area between 1852-1970 is included.

EAST ST. LOUIS: THE RIVERFRONT CHARADE, Southern Illinois Univ., Edwardsville. Regional and Urban Development Studies and Services.

RUD Report No 6, December, 1970. 42 p, 2 fig, 43 ref. 1 append.

Descriptors: Planning, *Urban renewal, Programs, Area redevelopment, Railroads, Community development, *City planning, *Illinois. Identifiers: *Urban waterfront, *Urban riverfront,

The study examines riverfront redevelopment in East St. Louis, Illinois. It concludes that although some cities such as St. Louis are successful in redeveloping part of their waterfront areas, most cities, including East St. Louis, will not be suc-cessful. The reasons for the failure of urban watercessful. The reasons for the failure of urban water-front redevelopment programs include the strong opposition of the railroads to relocate, the lack of state and federal funds for redevelopment, the reluctance of new commercial and industrial ac-tivities to invest in waterfront areas, and the over emphasis of local politicians and officials on short-range goals and projects. The study outlines the events involved in the East St. Louis redevelop-ment movement and concludes that this movement will likely remain at the planning level. Planning, in many cases has become a substitute for action and is often done only because the money is available but with no real hope for implementation. (Elfers-North Carolina) W73-07176

LAKE GENEVA, WALWORTH COUNTY: AN INVENTORY WITH PLANNING RECOMMEN-DATIONS.

sin Dept. of Natural Resources, Madison.

Lake Use Report No Fx-1, 1969. 17 p, 5 fig, 8 tab. (Prepared for Southeastern Wisconsin Regional Planning Commission).

Descriptors: *Lakes, *Lake shores, Shoreline cover, Shore protection, Water quality control, Recreation, *Land use, Zoning, Sewerage, *Wisconsin, Urbanization. Identifiers: *Shoreland management, Sanitary ordinances, *Lake Geneva (Wis).

Field 06-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

The report is one in a series made for lakes in southeastern Wisconsin. These lakes, particularly Lake Geneva, are not only used extensively for recreation, but also have significant urban development on their shorelands. A physical description of the lake includes climate, hydrology, soils, water quality, aquatic plants, fish resources, lake uses (e.g. fishing, boating, and swimming) and existing shoreland development. The environmental quality problems arising from the use of the lake and its shorelands and the existing and proposed regulatory measures to protect the lake from this environmental degradation are discussed. The primary protective measures are sanitary ordinances, sewerage systems, land use zoning, and water use zoning. The lake reports are used by the Southeastern Wisconsin Regional Planning Commission in its comprehensive planning program for the rapidly urbanizing metropolitan Milwaukee area. (Elfers-North Carolina) metropolitan Carolina) W73-07178

SEWERAGE AND WATER PLANNING RE-PORT (FOR) METROPOLITAN COUNCIL OF THE TWIN CITIES AREA, MINNESOTA. Metcalf and Eddy, Inc., Boston, Mass. For primary bibliographic entry see Field 05D. W73-07179

WATER FOR NEVADA: FORECASTS FOR THE FUTURE - MINING, Nevada Bureau of Mines and Geology, Reno. For primary bibliographic entry see Field 06D. W73-07246

COASTAL ZONE MANAGEMENT FOR DELAWARE. For primary bibliographic entry see Field 02L. W73-07247

CASE STUDIES OF DESALTED WATER FOR IRRIGATION,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 03A.

THE INTER-RELATIONSHIP OF WATER QUANTITY AND QUALITY AS A DETERMINANT OF WATER MANAGEMENT POLICY, MITRE Corp., McLean, Va.

Water Research, Vol 6, No 12, p 1501-1508, December, 1972. 1 fig, 2 tab, 5 ref.

Descriptors: "Water resources, "Management, "Comprehensive planning, "Water quality, "Water quantity, "Colorado River, Southwest U.S., Water supply, Pollution taxes (Charges). Identifiers: "Water pricing, Northwest Mexico.

Water quality and quantity, institutional and legal aspects, and economics are some of a variety of factors considered in comprehensive water resources management. Water quality has begun to attain a prominent position; however, its relation to water quantity and to water system operation tends to be largely overlooked. The Colorado River system is researed as a case in some The tion tends to be largely over-looked. In Colorado River system is presented as a case in point. The river basin encompasses an area which is one-twelfth the size of continental United States. The water is utilized principally for irrigation of semi-arid areas in the southwestern United States and in northwestern Mexico. Despite its importance, the river system operates under laws and regulations that continue the state of the stat that are not conductive to efficiency. Con-sequently water is used wastefully and a progressive deterioration in the quality of the river wa sive deterioration in the quanty of the river water is evident. Changes in water management are recommended. The pricing of supplied water ac-cording to its quality as well as charges for pollu-tion are suggested. In water resources planning, the entire system must be regarded as a single unit

composed of interconnected and dependent parts. Nevertheless, water quantity is the single factor with the most profound impact on the quality of water. The Colorado River basin exemplifies the interrelationship between water quality of interrelationship between water quality and quantity which must be recognized and accorded a central position in the management of water quality. (Bell-Cornell) W73-07368

SYSTEMS ANALYSIS: WHAT CAN IT DO. Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 06A. W73-07360

CAPITAL-COST MINIMIZATION OF HYDRAU-

LIC NETWORK,
Technische Hochschule, Karlsruhe (West Germany). Institut fur Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 04A.
W73-07370

PLANNING AND UPDATING FARM IRRIGA-TION SCEDULES,
Technion - Isreael Inst. of Tech., Haifa. Low-dermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-07371

DECISION MAKING IN HOMEOWNER PUBLIC WATER SUPPLY, Illinois Univ., Chicago. Dept. of Quantitative Methods.

Methods.
K. J. Cypra.
Journal of the Urban Planning and Development
Division, American Society of Civil Engineers,
Vol 99, No UPI, Proceedings paper 9597, p 97103, March, 1973. 2 tab.

Descriptors: "Water supply, "Economic analysis,
"Statistical methods, "Financing, Forecasting,
Planning, Estimating, Decision making.
Identifiers: Public works, Public water, Urban
planning, Municipal engineering, Impact tests,
Homeowners.

In planning, designing, and financing a public water supply system in areas where connection is not mandatory, the degree to which people in a given area do, in fact, connect to the public supply is of major importance. In urban fringe areas, homeowner decisions regarding being connected threaten the real possibility of too few connections and low initial consumption per cents. In light of and low initial consumption per capita. In light of these decisions, policy makers and planners must evaluate revenues and initial design requirements so that the economic viability of the system will not be undermined by too few connecti not be undermined by too few connections. Pac-tors entering a decision to connect to a municipal water supply are principally its cost, the quality of the water emanating from the existing well, and the degree to which the well functions mechanithe degree to which the well functions mechani-cally properly. Investigations of homeowner deci-sion making behavior are made utilizing a homeowner interview technique which addresses decisions made, factors underlying these deci-sions, perceived reasonable connection and usage charges, and the role of a private well after con-nection to a public water supply. Two geographic areas are studied, one in which public water is available with emphasis on past decisions, and one in which public water is an impending possibility with the emphasis on future decisions. (Bell-Cor-nell) nell) W73-07373

ECONOMIC EVALUATION WITHIN THE WATER INDUSTRY,
Metropolitan Water Board, London (England).
A. F. Mann, and R. W. Taylor.
British Water Supply, The British Waterworks Assoc. (Inc.), No 12, p 26-28, December, 1972. 1 fig, Descriptors: "Computer models, "Economic analysis, "Alternative planning, "Decision making, "Pumping plants, "Management, Water quality control, Filters, Financial feasibility, Optimum development plans, Operations research. Identifiers: "Kempton Park Works, England, Metropolitan Water Board, Contact tanks.

Computer based financial modelling is becoming more widely utilized to aid in making management decisions. Its uses vary from cash flow forecasting, investment simulation, and sensitivity analysis to the complete modelling of an organization's financial structure. Yet many skeptical managers regard the technique as theoretical nonsense. To remove some of the myths and existing doubts, a commentary is presented which describes the Kempton Park Investment Proposal (within Britain's Metropolitan Water Board) for water works modification, extension, and improvement plans. A computer model (the PROSPER model) was used, which represents all of the financial factors involved in the investment appraisal, structured in a form that can be processed on an ICL computer. The model selected all capital and tured in a form that can be processed on an ICL computer. The model selected all capital and running costs and ultimately provided an array of Net Cash Flows and Net Present Values for each of 120 investment options, over the period 1972-2007. Using the Net Present Value as a common means of comparison, the six 'best' options were selected; the estimated costs were refined, and the model was re-run, this time with different interest rates to assess the affect of a change in the interest rate. The most economic option was chosen as the best scheme for Kempton Park. (Bell-Cornell) W73-07376

ANALYSIS OF THE REGULATION, OR-GANIZATION AND OPERATIONS OF A RE-GIONAL WATER MANAGEMENT INSTITU-TION FOUNDED IN 1846, Harbridge House, Inc., Boston, Mass. For primary bibliographic entry see Field 06E. W73-07417

THE PARTICIPATORY ROLE OF CITIZEN AD-VISORY GROUPS IN NEW ENGLAND WATER RESOURCE PLANNING: A PRELIMINARY

STUDY, Massachusetts Univ., Amherst. Water Resources Research Center.

Available from the National Technical Informa-tion Service as PB-218 712, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, June, 1972. 18 p., 22 ref. OWRR A-051-MASS (1).

Descriptors: *Water resources planning, *New England, Coordination, Social aspects.
Identifiers: *Public participation, *Citizen advisory groups, *Advisory committees, Ecological concerns, New England River Basins Commission.

Several citizens advisory groups in New England, particularly those related to water resources planning, are surveyed. In addition, the concept of advisory groups is critically discussed and research issues relating to their roles are outlined. Citizen advisory groups are seen to fall into three categories: elected groups or groups that are politically-accountable such as town planning boards and conservation commissions; self-generated or private groups usually formed in relation to some ecological issue and often eventually given some formal status in relation to federal agencies or projects; and appointed groups to help in early stages of planning such as those appointed by the New England River Basins Commission and the Army Corps of Engineers. Advisory groups are expected to play an important role in water resources planning, given the increasing public ecological concern and lack of faith in governmental decision-making. A key distinction is made between the old, special interest advisory committee and the new citizen groups. Problems of practical operation in terms of (1) representativeness of ap-Several citizens advisory groups in New England,

pointed advisory groups, (2) financial support, and (3) goal identification are discussed briefly. (El-fers-North Carolina) W73-07421

AN INVENTORY AND EVALUATION OF THE GAME AND FISH RESOURCES OF THE UPPER GREENRIVER IN RELATION TO CURRENT AND PROPOSED WATER DEVELOPMENT PROGRAMS, Wyoming Univ., Laramie. Dept. of Zoology and Physiology. N.A. Binns.

N.A. Binns.

Available from the National Technical Informa-tion Service as PB-218 812, \$3.00 in paper copy, \$9.95 in microfiche. Wyoming Water Resources Research Institute, Laramie, Completion Report, November 1972. 196 p., 70 fig. 25 tab, 106 ref. (PhD Thesis). OWRR B-002-WYO (2). 40-10-01-1568.

Descriptors: *Surveys, Census, *Wildlife habitats, Fisheries, *Wyoming, *Fish harvest, Fishing, Rainbow trout, Brook trout, Broown trout, Water resource development, Project feasibility, Evalua-

tion, *Trout.
Identifiers: *Green River (Wyo), Whitefish, *Reservoir sites (Proposed).

From 1967 to 1970, an inventory was made of the wildlife resources of the Upper Green River in Wyoming with the objectives of evaluating the general quality of the wildlife resources and of predicting the effects of water development programs on these resources in the future. Fish resources inventory included densities per river mile for wild and stocked rainbow trout, brown trout, brook trout, and whitefish. An average of trout, brook trout, and whitesian in a couple, 6,500 trout was harvested each summer from the public fishing areas. An estimated 5,760 fishermen and associates used the three public fishing areas, and associates used the three puone risking areas, which averaged 88 fishermen per mile per summer and 0.72 fishermen per mile per day. The majority of fishermen and associates expressed satisfaction with fishing, accept, wildlife, and the present state of area development. The results of a post-card survey indicated that the estimated total value of the fishery was \$548,870, or \$12,180 per value of the linesty was 3-3-5-5, 12-100 per river mile. Game species in the area contributed to the state-wide game harvest as follows: moose, 28%; antelope, 4%, mountain sheep, 11%, elk, 8%; and deer, 4%. Adam at either the Kendall or New Fork sites would estimate those stream sections inundated by the reservoir. Although the total fishery resource would probably be increased, the type of fishery would be changed from quality stream fishery to a reservoir fishery. The proposed Kendall reservoir would inundated critical moose winter range, which would necessitate a substantial reduction in moose numbers to bring the herd into balance with the remaining habitat. The proposed New Fork Reservoir would result in both summer and winter habitat losses for migrating and resident deer, moose, and antelope herds. Fork sites would estimate those stream section both summer and winter habitat losses for migrat-ing and resident deer, moose, and antelope herds. Fish and waterfowl would benefit from the Lower Green Reservoir, while the impact would be nega-tive for game animals. Reservoir development at any of the three sites would offer reservoir-based recreation opportunities, such as boating, fishing, and watersking. W73.07405.

EVALUATING BENEFITS OF ENVIRONMEN-EVALUATING BENEFITS UP ENVIRONMENTAL RESOURCES WITH SPECIAL APPLICA-TION TO THE HELLS CANYON, Resources for the Future, Inc., Washington, D.C. Natural Environments Program.

J. V. Krutilla, and C. J. Cicchetti.
Natural Resources Journal, Vol 12, No 1, p 1-29, January, 1972. 7 fig, 5 tab, 24 ref, 2 append.

Descriptors: *Economic analysis, *Benefits, *Environmental effects, Resources, Hydroelectric power, Preservation, Income, Population, Mathematical models, Simulation analysis, Systems analysis, Rivers.

Identifiers: *Hells Canyon, *Snake river, *Environmental quality, *Opportunity costs, Landscape alteration, Extractive industries, Geometric growth rates.

growth rates.

There exists a growing sensitivity to assaults on the quality of the environment. Despite Pigouvian welfare economics, providing the conceptual basis for appreciation of opportunity costs of unancipated side effects, economists have been late in recognizing the economic implications of the relationships so well known to biologists and ecologists. The adverse side affects of various activities for environmental quality should be incorporated in economic calculus. A detailed economic analysis is presented of a practical problem in which a potential assualt on the environment is likely to have an adverse irreversible consequence. Extractive industries cause the most serious impact on the visual character of landscapes, and they modify ecological characteristics thereby reducing the biological diversity typically found in the natural environment. This analysis is concerned primarily with the opportunity costs of landscape modification. Used as the special case for illustration is the problem involving the current controversy over the Hells Cannon of the Santon Users. tool. Used as the special case for insuration is the problem involving the current controversy over the Hells Canyon of the Snake River—whether to develop for hydroelectric purposes or preserve for inclusion in the Wild and Scenic Rivers System. Displayed in detail are the results obtained in the economic evaluation of the two incompatible alternative uses of Hells Canyon. (Bell-Cornell)

BASIC PROBLEMS IN THE WATER ECONO-MY OF AGRICULTURE, Water Economics Research Inst., Warsaw (Poland).

For primary bibliographic entry see Field 03F. W73-07446

TRENDS OF THE WATER ECONOMY POLICY AGAINST THE BACKGROUND OF THE TASKS OF THE 5-YEAR PLAN OF 1971-1975, Water Economics Research Inst., Warsaw (Po-

land).

Z. Januszko.

Available from the National Technical Informa tion Service as Part of TT70-55098/7, \$3.00 in paper copy, \$0.95 in microfiche. In: Water Economy, 1972, p 5-22. Translation of Gospodarka Wodna, Vol 30, No 7, 1970.

Descriptors: *Water resources development, *Water management (Applied), *Water policy, *Planning, Pollution abatement, Treatment facilities, River regulation, Stream improvement, Embankments, Reservoirs.
Identifiers: *Poland, *Five-Year Plan.

Identifiers: *Poland, *Five-Year Plan.

The work accomplished from 1956 to 1970 under Poland's long-range water management and development plan is briefly evaluated, and the water resources development goals for 1971-1975 are discussed. The 1971-1975 feve-year plan has three major goals: (1) the prevention and abatement of water pollution, (2) improved regulation of rivers and mountain streams, and (3) the construction of new reservoirs. Increased attention to pollution abatement or prevention will be necessary because total industrial production is expected to increase by about 40 percent over the next five years. To offset the concomitant in industrial wastes, it will be necessary to build a number of new sewage treatment plants, expand and modernize the present treatment plants, and improve the operation of sewage-treatment equipment. The plan calls for work on river regulation and mountain stream embankment over a length of 8.5 thousand km in 1971-1975. The water requirements of the cities, industry, and agriculture are as thousand in 1971-1975. The water lequine-ments of the cities, industry, and agriculture are expected to increase by about 47 percent between 1970 and 1975. To meet this growth in demand, a number of reservoirs must be constructed. The role of scientific research in water management is also briefly discussed. (Settle-Wisconsin)

W73,07447

CENTRALIZATION OF WASTE TREATMENT CENTRALIZATION OF WASTE TREATMENT FACILITIES, Florida Technological Univ., Orlando. Environ-mental Systems Engineering Inst. For primary bibliographic entry see Field 05D. W73-07456

A MODEL FOR ALLOCATION OF SEWAGE TREATMENT SYSTEMS TO THE NAVAL

FLEET, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 05D. W73-07458

SEWERAGE PLAN INVOLVES OPEN SPACE PRESERVATION, Inter-American Development Bank, Washington,

For primary bibliographic entry see Field 05D. W73-07462

MATHEMATICAL MODELS AND THEIR USE IN WATER RESOURCES DECISION-MAKING, Resources Research Centre, Ottawa (Ontario). For primary bibliographic entry see Field 06A. W73-07529

GREAT LAKES SIMULATION MODEL—A DECISION AID,
Department of the Environment, Ottawa (Ontario). Water Management Service.
For primary bibliographic entry see Field 06A.
W73-07530

APPLICATION OF HYDROLOGIC SIMULA-TION TO WATER RESOURCES PLANNING, Hydrocomp International, Palo Alto, Calif. For primary bibliographic entry see Field 06A.

WALLACE DAM, Georgia Power Co., Atlanta. For primary bibliographic entry see Field 08A. W73-07554

ETHICAL AND SOCIAL RESPONSIBILITY IN THE PLANNING AND DESIGN OF ENGINEER-ING PROJECTS, Colorado Univ., Boulder.
D. Mann.

Journal of Professional Activities, American Society of Civil Engineers, Vol 98, No PP1, p 33-41, Jan 1972. 18 ref, append.

Descriptors: "Social aspects, "Environmental engineering, "Ethics, Bibliographies, Social impact, Decision making, Economics, Environment, Water resources development, Social participation, Social values, Environmental effects, Planning, Public benefits. Identifiers: "Environmental quality, Eco-engineering, Design practices, Public relations, "Responsibilities.

The engineer must avoid contributing to the causes of criticism regarding environmental protection. The professional engineer is obligated to serve the community at the same time as his client. Professional codes have so community at the same time as his client. Professional codes, however, concentrate more on responsibility to clients. Existing guidelines are reviewed, particularly applicable provisions of the ASCE Code of Practice, followed by discussion of practical implications. The first source of an engineer's environmental responsibility is his duty to the community; the second source is his professionalism. His professional conscience can no longer be satisfied with economical design alone. Ethically, the engineer should avoid project

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salesmanship, either by advocating projects op-posed by environmental groups, or by allowing management to use his name or reputation in sup-port thereof. Interested environmental groups should be consulted during the planning stage, to minimize impact. The construction engineer should be alert to environmental problems not an-ticipated in planning and design. The readiness of an engineer to discontinue his services to his em-ployer because a project is not in the public inployer because a project is not in the public in-terest can only earn respect and honor for his profession. (USBR) W73-07556

DROUGHT IMPACT ON REGIONAL ECONO-

MY, Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
J. Millan.

Colorado State University Press, Hydrology Papers, No 55, October 1972. 71 p, 16 fig, 10 tab, 75 ref.

Descriptors: *Droughts, *Regional analysis, *Economic impact, *Statistical models, *Regional economics, *Planning, Economics, Hydrology, Statistics, Mathematical studies, Probability, Sampling, Monte Carlo method, Methodology, Mathematical models, *Colorado River basin, Evaluation, Agriculture.

The characteristics of drought as a natural event and drought as a hazard to the regional economy are studied. Runs as statistical properties of hydrologic sequences are used in an objective definition of droughts. The probability distributed the learned security run-length to be found definition of droughts. The probability distribu-tions of the longest negative run-length to be found in a sample of size N are reviewed and analytically defined for some simple cases of time dependence. An approximation is introduced for the case of the truncation level being of a linear trend type. The Monte Carlo method in generating large numbers of hydrologic samples is used in conjunction with a model of the regional economy to determine the economic impact of droughts. A programming foreconomic impact of droughts. A programming for-mulation of a dynamic type interindustry model is used to simulate the regional economy over a selected time horizon in order to allocate the drought shortages and compute its losses follow-ing a consistent procedure. The methodology developed is applied to a case study of the Upper Main Stem of the Colorado River Basin. The main stem of the Colorado River Basin. Interesults show advantages and flexibility of the model developed for analyzing the alternative policies for regional management of water resources during drought periods. (Black-Arizona) W73-07640

TECHNIQUES FOR ASSESSING HYDROLOGICAL POTENTIALS IN DEVELOPING COUN-

Agency for International Development, Washington, D.C. Office of Science and Technology. For primary bibliographic entry see Field 07C. W73-07667

'WATER SYSTEMS.' COORDINATION PLAN 'WATER SYSTEMS,' CUDUDINATION FLACA AND DEVELOPMENT PROGRAM PHASE I -'WATER' SUPPLY 'SYSTEMS', WASTE 'WATER' POLLUTION CONTROL 'SYSTEMS', AND SURFACE 'WATER' DRAINAGE AND SURFACE

Ellers, Reaves, Fanning and Oakley, Inc., Memphis, Tenn. For primary bibliographic entry see Field 03D.

W73-07690

REPORT OF THE OHIO RIVER BASIN ON THE WABASH RIVER BASIN COMPREHENSIVE

Ohio River Basin Commission, Cincinnati For primary bibliographic entry see Field 06E.

WATER RESOURCES COUNCIL REPORT ON THE WABASH RIVER COMPREHENSIVE BASIN STUDY: ILLINOIS, INDIANA, AND

OHIO.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-07694

WATER RESOURCES PLANNING. For primary bibliographic entry see Field 06E. W73-07709

ECOLOGICAL PERCEPTION: A STUDY OF ADOLESCENT AND PARENTAL ATTITUDES, North Carolina State Univ., Raleigh. Dept. of

Sociology and Anthropology.
W. J. Jacobs.
M.S. Thesis, 1972, 67p. 10 tab, 73 ref, 3 append.
OWRR-A-049-NC (1), 14-31-0001-3233.

Descriptors: *Attitudes, *Social values, *Ecology, Environment, *Water pollution, Social aspects, *Psychological aspects, *North Carolina. Identifiers: *Perception.

Purpose was to explore the characteristics which differentiate the ecologically aware and unaware and to differentiate between adolescent and adult attitudinal states as far as they reflect values, norms and beliefs concerning ecological conditions as a social problem. The data were obtained by interviewing 290 eleventh and twelfth grade pupils in the Wake County, North Carolina public high schools and mailing a similar questionnaire to their parents. In the latter case, 93 responses were obtained. The findings indicate a universality of appeal concerning the extent of ecological problems for both adolescents and adults. None of the characteristics explored differentiated among the ecologically aware and the ecologically the ecologically aware and the ecologically unaware. However, tendencies for differences to occur are recognized and suggested as a basis for further study.

A MATHEMATICAL MODEL FOR PRELIMINARY EVALUATIONS OF CANDIDATE RESERVOIR SYSTEMS,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08A. W73-07727

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

HISTORY OF DESALTING OPERATION, MAINTENANCE, AND COST EXPERIENCE, For primary bibliographic entry see Field 03A. W73-07650

6D. Water Demand

WATER FOR NEVADA: FORECASTS FOR THE

WATER FOR NEVADA: FURELASIS FOR THE FUTURE — MINING, Nevada Bureau of Mines and Geology, Reno. A. Baker, N. L. Archbold, III, and W. J. Stoll. Nevada Water Planning Report No 4, January 1973. 223 p. 24 fig, 33 map, 114 tab, 16 ref.

Descriptors: *Water resources, *Mining, *Water demand, *Nevada, Projectiona, Forecasting, Mine water, Mineralogy, Technology, Mineral industry, Geology, Rocks, Reviews, Evaluation.

As a part of the development of the State of Nevada Water Plan, the Division of Water Resources is estimating the need for water and re-lated land resources for the coming 50-year period. This Report (no 4) is divided into seven parts. Part 1 is concerned with a generalized overview of the

mineral industry in Nevada. In Chapter 2 mining technology and factors used in later chapters to reach estimates of future water and manpower needs are described. Chapter 3 is a brief history of needs are described. Chapter 3 is a tries insistry or Nevada's mineral industry. Its purpose is to sum-marize major events in mining activity and to pro-vide the perspective against which projections of the future should be viewed. Chapter 4 presents major assumptions concerning the variables ex-pected to affect the State's mineral industry during major assumptions concerning the variables expected to affect the State's mineral industry during the next fifty years. Chapter 5 is a resume of Nevada's geology in which the basic giologic pattern of the State is outlined. Chapter 6 presents the classification of mineral commodities. Chapter 7 is a comparison of the estimates with those reached in Great Basin Region, Comprehensive Framework Study, Appendix VII, Mineral Resources, prepared by the Pacific Southwest Inter-Agency Committee, Water Resources Council June, 1971. (Woodard-USGS) W73-07246

RECENT WATER RESOURCES DEVELOP-MENT IN TAIWAN, REPUBLIC OF CHINA, Taiwan Power Co., Taipei. For primary bibliographic entry see Field 04A. W73-07390

BASIC PROBLEMS IN THE WATER ECONO-MY OF AGRICULTURE, Water Economics Research Inst., Warsaw (Po-

For primary bibliographic entry see Field 03F. W73-07446

GEOTHERMAL ENERGY - GROV SPURRED ON BY "POWERFUL MOTIVES", Union Oil Co. of California, Los Angeles. Mining Engineering, Vol 24, No 10, p 100-102, October 1972, I fig. 11 ref.

Descriptors: *Geothermal studies, *Electric power demand, *Electric power costs, Electric power production, Thermal powerplants, Thermal on, Powerplants, Economics, Beneficial

Identifiers: *Geothermal powerplants, Geother-

Due to the threatened energy crisis geothermal exploration and development is being carried out in at least 35 countries. However with about 800 MW at least 35 countries. However with about 800 MW installed generating capacity worldwide, the status of this form of energy is rudimentary, amounting to 0.1% of the world's total energy production. In spite of competition from other forms of energy, this type of powerplant is considered because of poor or lacking resources of fossil fuels and usual lack of sufficient economical base for nuclear country and country that the contract of the country of th lack of sufficient economical base for nuclear power development in many developing and developed countries. Of the projects now underway, the Geysers - with 630 MW planned capacity (1975) - in Califormia is discussed in most detail. The Geysers project proved that geothermal energy is a viable source of commercial electric power and offers highly competitive generating costs as compared to conventional or nuclear power generation. (Oleszkiewicz-Vanderbilt) W73-07488

MUDDLING THROUGH THE ENERGY CRISIS, J. V. Beall. Mining Engineering, Vol 24, No 10, p 41-48, Oc-

tober 1972, 9 fig. 4 tab.

Descriptors: *Electric power demand, *Electric power production, *Energy budget, Energy con-version, Oil, Natural gas, Fossil fuels, Fuels, Coals, Nuclear energy, Breeder reactors, Economics, Cost analysis. Identifiers: *Energy crisis, Energy markets.

Water Law and Institutions—Group 6E

A general picture of the energy situation in the United States is presented. It is predicted that the coal market will nearly double before 1985. Demand for petroleum is at an all time high, 15.13 million barrels per day, Forecasts of 1985 oil demand are between 26-30 million barrels per day. This will require an increase in imports from 27 to 79%. Looking ahead, the demand for natural gas, which is produced at a rate of 22 trillion or it per year, will be far in excess of supply. Atomic Energy Commission projects installed nuclear plants generating capacity of 139,000 megawatts in 1980 and 286,000 megawatts in 1985. The hydropower potential, excluding pumped storage, is 178.5 million KW, whereas the U. S. had developed 48.5 million KW by 1971. (Oleszkiewicz-Vanderbilt) W73-07489

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FUTURE ALTERNATIVES AFFECTING THE AGRICULTURAL DEMAND FOR WATER AND LAND; THE EFFECTS OF SOY PROTEIN MEATS AND NITROGEN FERTILIZER RESTRICTIONS ON FUTURE WATER AND

LAND USE, lowa State Univ., Ames. Center for Agricultural

and Rural Development.
For primary bibliographic entry see Field 03F.
W73-07651

6E. Water Law and Institutions

MONTANA WATER RIGHTS-A NEW OPPOR-TUNITY, Montana State Univ., Bozeman. Water Resource

A. W. Stone

A. W. Store. Available from the National Technical Informa-tion Service as PB-218 811, \$3.00 in paper copy, \$0.95 in microfiche. Report No 33, 1972, 24 p, 81 ref. OWR.-A-051-MONT (1).

Descriptors: "Water law, "Water rights, Adjudica-tion, Administration, "Montana, Legislation, "Water permits, State governments, Legal aspects.
Identifiers: *Montana water law.

This report is one of a series of reports analyzing problem areas in Montana's water law and pointing out alternative courses of action that will provide for a more efficient and equitable system. This matter is of great concern to Montana at the present time because it is in the process of adopting a new constitution and new legislation is needed to make it an effective document. A number of water right court cases were examined and findings spell out many shortcomings in the present water law system of Montana. The three nain conclusions are: (1) there must be a conclumain conclusions are: (1) there must be a conclusive ascertainment of existing water rights within the state; (2) future water rights must be acquired by permit; and (3) administering the water resource should be recognized as an administrative, not a judicial task. (Holje-Montana State) W73-07157

DECISION MAKING IN WATER RESOURCE INVESTMENT AND THE POTENTIAL OF MULTI-OBJECTIVE PLANNING: THE CASE OF THE ARMY CORPS OF ENGINEERS, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 06B.

W73-07159

A STUDY OF FLOODPLAIN DEVELOPMENT AND FLOODPLAIN REGULATIONS.
Greater Anchorage Area Borough, Alaska. Flanning Dept.
For primary bibliographic entry see Field 06F.
W73-07175

SUGGESTED FLOOD DAMAGE PREVENTION ORDINANCE WITH COMMENTARY. Northeastern Illinois Planning Commission, Chicago.

Commission Report No 9, revised and reprinted, March, 1972. 28 p, 1 fig, 3 append.

Descriptors: "Flood protection, "Flood control, Flood plains, Floodways, "Flood damage, Planning, Drainage programs, Detention reser-voirs, "Legislation, "Illinois. Identifiers: Floodplain management, Flood plain

The suggested ordinance, plus commentary on many of the provisions, is prepared as a planning aid for cities and counties in northeastern Illinois. The suggested provisions cover regulations that could be included in separate zoning, sanitary, building, and subdivision ordinances. Thus, the model ordinance brings together all rules related to flood damage prevention in one document. The elements covered include permit systems, delineation of floodways and flood hazard areas, subdivision drainage, buildings on flood plains, detention basins, sewer systems, and compensatory storage. The commentary notes accompanying many of the provisions attempt to explain the purpose of the provisions and relate them to the comprehensive planning program being carried out by the Northeastern Illinois Planning Commission. (Elerer-North Carolina) W73-07177

GROUND WATER QUALITY CONTROL. Michigan Dept. of Public Health, Lansing. For primary bibliographic entry see Field 05G. W73-07339

RULES AND REGULATIONS GOVERNING DRILLING OF WELLS AND APPROPRIATION AND USE OF GROUND WATER IN NEW MEX-

New Mexico State Engineer, Santa Fe. For primary bibliographic entry see Field 08A. W73-07342

THE INTER-RELATIONSHIP OF WATER QUANTITY AND QUALITY AS A DETERMINANT OF WATER MANAGEMENT POLICY, MITRE Corp., McLean, Va. For primary bibliographic entry see Field 06B. W73-07368

ANALYSIS OF THE REGULATION, ORGANIZATION AND OPERATIONS OF A REGIONAL WATER MANAGEMENT INSTITUTION FOUNDED IN 1846, Harbridge House, Inc., Boston, Mass. R. D. Crangle.

R.D. Crangle.

Available from the National Technical Information Service as PB-218 819, \$5.45 paper copy, \$0.95 in microfiche. Final Completion Report, November 1972. 161 p. 145 ref, 4 append. OWRR C-3146 (no 3695) (1). 14-31-0001-3695.

Descriptors: "Regional analysis, "Municipal water, "Institutional constraints, Publications, "Water distribution (Applied), "Massachusetts, "Decision-making, "History, Administrative agencies, Local governments, Political constraints, Inter-basin transfers, Reservoir operation, Water rates, Water supply, Operating costs, Water resources development, Cost repayment, Humid areas, Public utility districts, Information retrieval, Bibliographies, Cities.

Identifiers: "Boston, Woburn (Mass).

In the summer of 1846 the Mayor of Boston and the President of the United States joined together in ceremonies commencing construction on the ci-ty's first public water supply from Lake Cochitu-

ate, 14 aqueduct miles west of Boston. In the summer of 1972 negotiations were concluded to permit the city of Woburn, 10 miles north of Boston, to enter the Metropolitan Water District and buy water at wholesale rates from the Metropolitan District Commission's Water Division. The activities of the intervening 126 years are essential to understanding this water supply operating agency, which today (1) must reconcile limited surface water resources with unknowable (uture demands (many communities not currently future demands (many communities not currently among the 40 now served have a right to request service); (b) establishes and consummates its pro-grams without the existence of a regional or state water resources policy; (c) finances annual operational deficits from new bond revenues; (d) is largely invisible to almost all Massachusetts citizens, ng most of the over two million receiving water from it; (3) faces the grim prospect of replacing highly motivated and qualified engineer-managers, now retiring, despite low pay scales and a tightly restrictive civil service system. Analysis of these and other issues is conducted, with recommendations (generalized for other areas) provided. A management handbook was drafted as part of the study; excerpts are included. (See also W73-07418) W73-07417

MANAGEMENT HANDBOOK WATER DIVI-SION, METROPOLITAN DISTRICT COMMIS-SION. Harbridge House, Inc., Boston, Mass.

Available from the National Technical Informa-tion Service as PB-218 706, \$3.00 in paper copy, tember 1, 1972, 244 p. OWRR C-3146 (No 3695)

Descriptors: "Regional analysis, "Municipal water, "Publications, "Massachusetts, "History, Administrative agencies, Local governments, Water rates, Water supply, Operating costs, Cost repayment, Public utility districts, Information retrieval, Bibliographies, "Legislation, Cities. Identifiers: "Handbooks.

Table of contents include: introduction; authorizing legislation and organization; special legislative acts, contractual agreements, and other information concerning the metropolitan water district's members, users, and neighbors; reference information about the water system and supply; statematter about the water system and supply; statements/sample letters in response to certain public inquiries; and metropolitan Boston water supply bibliography. (See also W73-07417)
W73-07418

THE PARTICIPATORY ROLE OF CITIZEN AD-VISORY GROUPS IN NEW ENGLAND WATER RESOURCE PLANNING: A PRELIMINARY

STUDY, Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 06B. W73-07421

WATER POLLUTION BY OIL. Institute of Petroleum, London (England). For primary bibliographic entry see Field 05G. W73-07464

ETHICAL AND SOCIAL RESPONSIBILITY IN THE PLANNING AND DESIGN OF ENGINEER-

ING PROJECTS,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 06B.

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

REPORT OF THE OHIO RIVER BASIN ON THE WABASH RIVER BASIN COMPREHENSIVE STUDY.
Ohio River Basin Commission, Cincinnati.

March, 1972, 48 p. 2 tab, append.

Descriptors: *River basin development, *Com-prehensive planning, River basin commissions, Environmental effects, Priorities, Indiana, Ilois, Ohio. Identifiers: *Ohio River Basin Commission, *Wabash River Basin, Flood plain management.

The Ohio River Basin Commission (ORBC) is The Ohio River Basin Commission (ORBC) is responsible for coordinated planning within the Ohio River basin of which the Wabash basin is a part. The ORBC concluded that the Wabash budy and plans are generally sound and that they are compatible with the Comprehensive Coordinated Joint Plan for the Ohio River Basin. Some of the specific recommendations of the Commission are: nagement, in addition to development, of the basin must be considered; priorities for early im plementation projects must be refined; there must be further environmental effects studies as individual projects are designed; and unanswered questions about the environmental corridors need further study. The review also contains letters of evaluation from all the states in the Ohio River basin and several federal agencies involved in water resource development in the basin. Much of the ORBC position on the Wabash study is based on these letters. (Elfers - North Carolina) W73-07693

WATER RESOURCES COUNCIL REPORT ON THE WABASH RIVER COMPREHENSIVE BASIN STUDY: ILLINOIS, INDIANA, AND OHIO

Water Resources Council, Washington, D.C.

August 1972, 7 p.

Descriptors: *River basin development, *Comprehensive planning, River basin commissions, River basins, Evaluation, Environmental effects. Ohio, Indiana, Illinois.

Identifiers: Water Resources Council, *Ohio River Basin Commission, Wabash River Basin

A brief summary and evaluation of the Wabash River Comprehensive Basin Study is presented. The study was done by federal and state agencies (e.g. the Army Corps of Engineers) under the guidance of a Coordinating Committee composed of federal and state representatives. This evaluation includes a short description of the Wabash of recera and state representatives. In its evaluation includes a short description of the Wabash basin, a summary of the Ohio River Basin Commission's reaction to the study, and the recommendations of the Water Resources Council. In general, the ORBC and the WRC approve of the study and its plans but come of their recommenstudy and its plans, but some of their recommen-dations include: the need to define priorities for the 'early action' elements of the plan; the need to prepare specific environmental impact reports for each project, particularly those related to channel improvements; the need to study the adequacy of state laws and policies for implementing the plan (e.g. floodplain management); and the need to look closer at recreation demands. The WRC recommends that Congress use the study as a guide for approving projects in the basin and publish and distribute it for public use. (Elfers - North Carolina) W73-07694

CONFERENCE: POLLUTION OF THE INTERSTATE WATERS OF THE POTOMAC RIVER-WASHINGTON METROPOLITAN AREA, STATES OF MARYLAND AND VIRGINIA, AND THE DISTRICT OF COLUMBIA. Federal Water Quality Administration, Washington, D.C.

For primary bibliographic entry see Field 05G. W73-07696

CONFERENCE: POLLUTION OF THE IN-TERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN.-NEW YORK-V-Federal Water Quality Administration, Washing-

ton, D.C. ary bibliographic entry see Field 05G. For primar W73-07697

THE MINNESOTA ENVIRONMENTAL RIGHTS ACT.
For primary bibliographic entry see Field 05G.
W73-07698

COASTAL ZONE MANAGEMENT.

Hearings--Subcomm. on Oceanography--Comm. on Merchant Marine and Fisheries, United States House of Representatives, 92nd Cong, 1st Sess, June 22, 23, 24, August 3, 4, 5, November 1, 9, 1971. 463 p, 1 map.

Descriptors: *Legislation, *Coasts, *Estuaries, **Land management, Conservation resources, Federal budget, Grants, Coastal marshes, Natural resources, Oceans, Administration, Legal aspects, Planning, Regulation, Governmental interrelations, Local governments, State governments. Identifiers: *Congressional hearings, *Coastal zone management zone management

The hearings took testimony on proposed legisla-tion dealing with the problem of how to handle the mounting pressures which threaten the rational conservation, utilization and development of zone resources. The witnesses who appeared before the Subcommittee represented various state and local governments, interested oceanographic and conservation organizations, and departments of the federal government. Three bills were under consideration. All three are designed to provide assistance to states in establishing coastal and estuarine zone management plans. A national policy for management and protection of the coastal zone would be established; this policy would be effectuated by rederal financial assistance to coastal states for the development and administration of comprehensive coastal zone management plans. (Reed-Florida) W73-07699

BUFFALO NATIONAL RIVER, ARKANSAS.

Hearings-Subcomm. on National Parks and Recreation, Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92nd Cong, 1st Sess, October 28 and 29, 1971. 204 p.

*Conservation, *Legislation, *Na-Descriptors: *Conservation, *Legislation, *Na-tional parks, *Arkansas, Rivers, Recreation, Na-tional recreation areas, Scenery, Wild rivers, Aesthetics, Public access, Tourism, Natural resources, Eminent domain, Land management. Identifiers: *Buffalo National River, Ark.

nmittee took testimony on bills that would establish the Buffalo National River to preserve the natural values present along the Buffalo River in Arkansas. There was a general concensus that the river should be ratained and protected. A conflict of opinion arose as to the manner in which this objective could be be accomplished. The dispute came down to whether to pass the House bills or the Senate bill. All bills permitted use and occupancy of improved property acquired for the river, though use was restricted to agriculture and non-commercial residential purposes. The House bills applied to permanent dwellings, the construction of which was begun before 1 January 1971. The witch Seated deedline user Leavery 1967. The but the Senate deadline was 1 January 1967. The House bills would pay the counties any real estate tax revenues lost due to the federal acquisitions and set a ceiling on the amount of land the federal government could acquire. The Senate bill did neither of the last two things. Testimony included descriptions of the area and the effect of a failure to create a national park. The park would be used for recreation and a scenic attraction. (Nielsen-

ALEXANDRIA WATERFRONT.

Hearing--Comm. on the District of Columbia-United States Senate, 92nd Cong, 2d Sess, August 17, 1972. 276 p, 2 fig, 1 map, 2 photo, 1 dwg, 2 tab,

Descriptors: *United States, *Land use, *Legisla-tion, *Boundary disputes, *High water mark, Land development, High-water mark, Boundaries Recreation, Zoning, Parks, management, Governments, Jurisdiction, Eminent domain, Governmental interrelations, Governments, Economics, Land tenure, Ownership of beds, Beds under water.

The committee discussed S.3861, a bill to convey to the City of Alexandria, Virginia, the interest of the United States in certain specific property along the Potomac River waterfront of that city, subject to approval by the Secretary of the Interior of a land use plan to be submitted by the City. It was stated that the passage of the bill would reduce title clouds over the property making it possible to develop the land to meet the needs of the community. The cause of the title dispute is the inability to ascertain the high water mark of the river in 1791, the boundary between Virginia and the District of Columbia. No title insurance company will write a policy for the disputed land; thus, the only types of developments that have been willing to locate on the property are of a marginal nature. The bill will not only correct the title dispute but will establish: (1) strict land use controls; (2) public access, walkways and parks; and (3) a permit system for a limited amount of building on the site. The subject property consist of 24 acres of grasslands and 24 acres of submerged land. (Beardsley-Florida) W73-07701

SOUTH DAKOTA FLOOD DISASTER.

Hearing-Subcomm. on Flood Control and Internal Development-Comm. on Public Works, United States House of Representatives, 92d Cong, 2d Sess, July 27, 1972. 103 p, 6 fig, 1 map.

Descriptors: *Cost-benefit ratio, *Flood damage, Cost benefit theory, Disasters, South Dakota, Floods, Legislation, Costs, feasibility studies, Project planning, Cost analysis, Regulation.

Identifiers: *Congressional hearings, Disaster re-

These hearings were held on the Rapid City South Dakota flood disaster. The subcommittee was interested in learning how the disaster relief process was operating and if any changes or additions were necessary for more effective and comprehensive relief. The validity and usefulness of the costbenefit ratio was also a matter of interest to the subcommittee, as were the rules which determ cost-benefit ratios. Representatives of the State, private citizens, members of the business commu ity and members of Congress made their views known to the subcommittee. The focus of the hearings was on disaster relief and description of the flood and resulting damage rather than on flood control or prevention. (Reed-Florida)

ADMINISTRATION OF THE NATIONAL EN-VIRONMENTAL POLICY ACT, PART II.
For primary bibliographic entry see Field 05G.

OMNIBUS WATER RESOURCES AUTHORIZA-TIONS-1972, PART 2.

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Hearings-Comm. on Public Works-Subcomm. on Flood Control, Rivers and Harbors, United States Senate, 92d Cong, 2d Sess, September 13-15, 1973, 87 p. 11 fig, 1 plate, 3 map, 16 photo, 13 tab, 3

Descriptors: *Flood control, *Water management (Applied), *Federal budget, *Water resources development, Water resources, Water supply, Legal aspects, Project planning, Flood protection, Watershed management, Floods, Flood damage, Navigation, Channel improvement. Identifiers: *Congressional hearings, Dam effects.

The second half of hearings conducted on the 1972 Omnibus Water Resources Authorizations is presented. Testimony was received by the comittee from representatives of state legislative delegations, Department of the Interior, various state flood control districts, state environmental protection agencies, the Army Corps of En-gineers, and various other state and federal agengeneers, and various other state and tectral agen-cies. Graphs, charts, and comprehensive studies are included with the textual information to pro-vide an informative basis in considering the pro-jects proposed for inclusion in the Omnibus Water Resources Authorizations legislation. Moreover, various state governors appeared to provide additional information concerning local water resources projects. (Mockler-Florida)

SALMON FALLS DIVISION, UPPER SNAKE RIVER PROJECT, IDAHO, PART II.

Hearing-Subcomm. on Irrigation and Reclama-tion-Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, May 15, 1972. 62 p, 1 map.

Descriptors: *Legislation, *Irrigation, *Irrigation systems, *Irrigation canals, project planning, Irrigation programs, Distribution systems, Water supply development, Idaho, Project benefits, Project purposes, Water policy, Fish, Wildlife management, Wildlife conservation, Water conveyance, Impoundments, Identifiers: *Snake River.

The purpose of the hearings was to take testimony in support of a bill that would authorize the Secretary of the Interior to construct, operate and maintain the Upper Snake River Project for purposes of irrigation and fish and wildlife enhancement. The subcommittee heard statements from the Governor of Idaho, the Commissioner of the Bureau of Reclamation, the Director of the Idaho Department of Water Administration, the Director of the Idaho Water Resource Board, representatives of Congress and other interested parties. The subcommittee received letters from the Bureau of Reclamation, the Assistant Secretary of the Intericommittee received letters from the Bureau of Reclamation, the Assistant Secretary of the Interi-or and other concerned parties. The plan of development is designed to supplement local water resources by pumping water from the pool behind Miner Dam. The water will be conveyed to the ir-rigated lands in a forty-seven mile canal. (Reed-Florida) W73-07706

STATE OF MARYLAND, DEPARTMENT OF NATURAL RESOURCES V. AMERADA HESS CORPORATION (ACTION AGAINST POLLUTOR OF BALTIMORE HARBOR).

350 F. Supp. 1060-1071 (D.C. Md. 1972.

Descriptors: *Common law, *Remedies, *Maryland, *Judicial decisions, *Water pollution control, *Pollution abatement, Water law, Water policy, Public health, Legal aspects, Jurisdiction, Law enforcement, Legislation, Oil pollution, Oil spills, Water pollution sources.

Identifiers: *Nuisance (Legal aspects), Public

Plaintiff state brought suit against defendants, a tanker corporation and an oil corporation for damages for injury to the waters of Baltimore Harbor arising out of the discharge of oil by defendants. Defendants answered that the state did not have a property interest in the waters of the state and could not therefore sue for damages to the quality of the water. They also contended that if the state wanted to protect its natural resources, it had to enact legislation. The court held that the state could bring a common law suit to redress an injury even though it also had the power to legislate against said injury. The state had a technical ownership in its waters by virtue of the public trust that gave it the legal right to bring suit on behalf of the public in order to protect their welfare. However, the court further held that since this was a single discharge, and not a continuing or recurring discharge, no action for nuisance was present and plaintiff could not sue defendant. (Glickman-Florida)
W73-07708

WATER RESOURCES PLANNING.

42 USC secs. 1962 thru 1962d-14 (1972).

Descriptors: *United States, *U.S. Water Resources Council, *Legislation, *Water resources development, *Administrative agencies, Administration, Legal aspects, Research and development, Resources development, Finances, Federal Government, Water law, Water policy, Water resources planning, Water sources planning, Water sources, Grants, Water supply.

planning, Water sources, Grants, Water supply.

A Water Resources Council is established to maintain a continuing study and to prepare a frequent assessment of the adequacy of water supplies necessary to meet the national need. The Council shall establish standards and procedures for participants in the preparation of regional or river basin plans and for the formulation of federal water resources projects. Upon request by the Council, the President may establish a river basin water and related land resources commission for any river basin. Each commission shall make the studies necessary in carrying out the policy of this section and for preparing a plan for water resources development for the basin for which the commission was established. Authorization is made for grants to the states to assist them in developing comprehensive water resources plans. The Secretary of the Army, acting through the Corps of Engineers is authorized to plan for long range water needs of the northeastern U.S., and to construct and operate approved water resources development projects. The Secretary of the Interior is directed to study the water resources of the Delmarva Peninsula and plan for future fresh water needs of that area. (Glickman-Florida) W73-07709

WATER RESEARCH AND DEVELOPMENT. 42 USC secs. 1951 thru 1958g (1972).

Descriptors: *Legislation, *Desalination, *Desalination plants, *Water treatment, *United States, Desalination processes, Saline water, Water yield, Water sources, Water chemistry, Water law, Water policy, Desalination apparatus, Water purification, Legal aspects, Finances, Research and development grants, Prototypes, Resources development.

It is the policy of Congress to provide for the large scale production of usable water by converting saline water, and for studies and research related thereto. The Secretary of the Interior will promote research to develop the best and most practical processes and plants for accomplishment of this purpose. The Secretary may make contracts and authorize research and training grants with a view

to advancing the development of low cost saline water conversion projects. The Secretary shall make regular reports to the President and Congress on action taken by him. Funds are authorized to be appropriated to carry out the provisions of these sections. The Secretary shall plan for the establishment of at least five demonstration plans to demonstrate the potentials of the conversion processes. The Secretary may enter into contracts for the construction of such plants and for their maintenance and operation. He may also accept financial and other assistance from state or public agencies in connection with operations under this section. (Glickman-Florida)

WATERWAYS, DRAINAGE, FLOOD CONTROL, WATER POLLUTION AND WATER RESOURCES STUDY COMMISSION; WATER TERMINALS. III. Ann. Stat. ch. 19 secs. 145.31 thru 149 (Smith-

Descriptors: "Illinois, "Legislation, "Flood control, "Water policy, Administrative agencies, Regulation, Control, Water law, Water resources development, Inland waterways, Water pollution, Water pollution control, Drainage, State governments, Federal Government, Governmental inter-

A commission is established to study waterways, drainage, flood control, water pollution and water resources. The Commission shall investigate progress, problems, the respective programs of various governmental agencies and their cost of administration, and the laws of the state (Illinois) relating to the above subject matter. The Commission may receive assistance from state political subdivisions as well as grants from federal, state or private agencies in carrying out its purpose. The Illinois Department of Transportation is authorized to improve the water terminal premise in Cook County for water terminal purpose any portions of the improved property, but no lease may be for more than ten years, subject to renewal for another ten. The Department may not sell any portion of the terminal. (Glickman-Florida)

RIGHT OF PUBLIC IN SHORE OF INLAND NAVIGABLE LAKE BETWEEN HIGH AND LOW WATER MARKS,

A. E. Korpela. 40 ALR3d 776-787 (1971). 22 p, 19 ref.

Descriptors: "Riparian land, "Lakes, "Riparian rights, "Public rights, "Judicial decisions, Legal review, Legal aspects, Water law, Water policy, Littoral, Intertidal areas, Recreation, Access routes, Recreation facilities, Recreation demand, Social needs, Navigable waters.

Identifiers: Public trust doctrine.

Identifiers: Public trust doctrine.

This annotation deals with cases on the issue of public rights in the strip of land between high and low water marks on inland navigable lakes. The rights of littoral owners are not discussed when two owners contest conflicting rights, but only where the state sues a littoral owner on behalf of the public. The few cases on the subject conflict greatly. The only proposition upon which they agree is that the contested strip has a different status from that of the adjacent upland and the adjacent permanently submerged lake bottom. The decisions appear to be affected by considerations such as the general availability of public waters for recreational purposes in the area and the pressure of developmental problems on the body of water in question. Some cases recognize the right of the public to travel upon and use the strip in question as long as there is no unreasonable interference with the littoral owner's right of access to the water, and others hold the owner's right to the land to be exclusive. (Glickman-Florida)

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

W73-07712

MAINTAINABILITY IN STATE COURT OF CLASS ACTION FOR RELIEF AGAINST AIR OR WATER POLLUTION,

47 ALR3d 769-774 (1972), 6 p. 5 ref.

Descriptors: "Public rights, "Pollution abatement,
"Judicial decisions, "Water pollution control,
Legal review, Legal aspects, Water law, Air pollution, Control, Constraints, Jurisdiction, Public
health, Water pollution, Water policy.
Identifiers: "Class actions.

This annotation investigates the specific question of whether a class action may be maintained for relief against air or water pollution in state courts. It distinguishes between cases in which there has been a direct challenge to the maintainability of an been a direct challenge to the maintainability of an environmental suit as a class action, and cases where it was asserted that plaintiff had no standing to sue, on behalf of the public, and deals only with the former. Although there is a limited array of cases dealing with this point, it appears that in environmental class actions, as in class actions generally, it is essential that the issues and relationships between the parties be such that a trial of the case would be manageable by the court. Where the class becomes so large that it encompasses too many divergent interests, it has been held that a class action may not be maintained. Further, where the size of the class creates a multiplicity of issues in a single action, the proceeding is deemed where the size of the class creates a multiplicity issues in a single action, the proceeding is deemed unmanageable and the action will be dismissed. (Glickman-Florida) W73-07713

FLOOD CONTROL AND BEACH EROSION.

Conn. Gen. Stat. Ann. secs. 25-71 thru 25-97

Descriptors: *Connecticut, *Legislation, *Flood control, *Erosion control, Administrative agencies, State governments, Local governments, Flood damage, Erosion, Flood protection, Floods, Hurricanes, Tidal effects, Navigation, Riparian lands, Littoral, Regulation, Governmental inter-relations, Project planning, Legal aspects.

The commissioner of environmental protection is authorized to provide for the payment by the state (Connecticut) of the total cost of any flood or erson control system which is for the benefit of state-owned lands. When such system is for the benefit of municipally-owned littoral or riparian property, or if the project will benefit privately-owned littoral or riparian property, the commissomer is authorized to pay a specified percentage of the cost. The commissioner is authorized to make arrangements for the use of facilities and services of the federal government, the municipalities or agencies of the state for the design and construction of such authorized. and construction of such systems. The commissioner may enter into agreements with the federal government or with any municipality for the pur-pose of constructing small flood control systems or tidal and hurricane protection and navigation projects. The statute provides for the reimbursement of public service companies for the reloca-tion of facilities in connection with flood control uon of facilities in connection with flood control projects. The state, acting through the commissioner, may enter into agreements with local authorities for the purpose of constructing projects or systems to prevent, correct and avert erosion and flood damage. All agreements entered into by the state must be approved, as to form, by the attorney general. (Reed-Florida)

CAMP PHOSPHATE COMPANY V. MARION COUNTY (INVERSE CONDEMNATION AND DRAINAGE OF SURFACE WATER).
201 So. 2d 793-795 (1st D.C.A. Fla. 1967).

Descriptors: *Florida, *Eminent domain, *Lakes, *Easements, *Judicial decisions, Condemnation, Legal aspects, Legal review, Right-of-way, Water law, Legislation, Drainage water, Drainage praclaw, Legislation, Drain tices, Highway effects. Identifiers: Drainage ea on, Drainage water, Drain

sements, Private lakes, In-

Petitioner, county, sought as easement over defendant phosphate company's land through which it proposed to install a pipe to drain overflow water from a state road project. The purpose of the easement was to drain the water into defendant's old mining pit, which had filled with water and was being used for recreational purposes. Defendant contended that dumping water into its pit or lake would constitute a taking of property for which petitioner should be required to pay. In dearying defendant's petition for certiorari, the District Dourt of Appeals held that the dumping of water into a landowner's lake did not constitute a taking, absent a showing that such an action would be detrimental to the landowner's ownership of the lake. (Reed-Florida)

STATE V.T.O.L., INC. (ACTION TO ENJOIN CONSTRUCTION OF BRIDGE ACROSS CANAL WHICH INTERFERES WITH MARINE TRAF-

206 So. 2d 69-73 (4th D.C.A. Fla. 1968).

Descriptors: *Riparian rights, *Navigation, *Florida, *Inland waterways, *Bridge construction, Channels, Bridges, Canals, Navigable waters, Navigable rivers, Rivers, Oceans, Access ic rights, Public access, Judicial decisions, Legal aspects.
Identifiers: *Nuisance (Legal aspects), Police

Plaintiffs, owners of property abutting waterways which flowed into a mosquito control canal, which provided access to a river and the sea, brought an action to enjoin as a public nuisance the construc-tion by defendant company, of a bridge across the canal. The bridge would have closed the northern terminus of the canal to most marine traffic but would have provided a roadway to a sewage treatent plant. Access to the ocean was still available through the southern end of the canal. Plaintiffs maintained that the canal was a permanent, navigable public waterway and that the bridge would interfere with their right to use the canal for navigation and for marine ingress and egress to their properties. Defendant argued that since the their properties. Detendant argued that since the bridge was being constructed pursuant to the ex-press mandate and requirement of the county com-missioners it could not be deemed a public nuisance. The Appellate Court held that this bridge constituted a valid exercise of the government's allow source and thus did not constitute a public police power and thus did not constitute a public nuisance. The court thereby affirmed the lower court. (Reed-Florida) W73-07716

STATE V. PUTNAM COUNTY DEVELOPMENT AUTHORITY (ISSUANCE OF MUNICIPAL REVENUE BONDS FOR CONSTRUCTION OF VASTE TREATMENT FACILITY).

249 So. 2d 6-13 (Fla. 1971).

Descriptors: *Government finance, *Treatment facilities, *Local governments, *Florida, *Bond issues, Judicial decisions, Legal aspects, Water pollution treatment, Water law, Legal review, Water policy, Water pollution control, Pollution abatement, Public health, Waste water treatment, Waste water (Pollution), Waste disposal, Financ-ing, Waste treatment, Public benefits. Identifiers: *Municipal revenue bonds.

Appellant, State, appealed from an order validating and confirming the issuance of industrial

development revenue bonds by the appellee County Development Authority for the purpose of financing the acquisition and construction of a water treatment facility. The treatment facility was planned to prevent the termination of operations of a paper mill threatened with fines for discharging improperly treated industrial waste. Appellant contended that the Florida Industrial Development Act, authorizing the financing of projects for promoting industrial economy and thus contributing to the prosperity and welfare of the inhabitants of the state does not authorize the Development Authority to finance the construction of a waste treatment facility at the paper mill since it wouldn't have a positive effect on the area, but merely maintain the status quo. The court determined that the Act intended to go beyond economic benefit; it was also intended to finance pollution control programs essential to improve the welfare of the inhabitants of the state by promoting a cleaner and healthier environment. The trial court's order was affirmed. (Glickman-Florida) W73-07717

UNITED STATES V. STANDARD OIL COM-PANY (DISCHARGE OF GASOLINE IN VIOLA-TION OF REFUSE ACT OF1899).

384 U.S. 224-237 (M.D. Fla. 1966).

Descriptors: *Water pollution control, *United States, *Rivers and Harbors Act, *Law enforcement, *Pollution abatement, Waste, Judicial decisions, Water law, Water policy, Legal aspects, Legislation, Oil pollution, Oil spills, Water pollution sources, Water quality stontrol, Water pollution, Water quality standards.

Identifiers: Refuse Act of 1899.

Appellee, Standard Oil was charged by appellant United States with violating the Refuse Act of 1899 by discharging gasoline into a navigable river. Appellee contended that as gasoline was deemed commercially valuable, it did not come within the Act's proscription against the discharge of refuse matter into the navigable waters of the United States. Appellee conceded that if waste oil were involved it would be refuse matter as understood by the Act, but since this was valuable oil it wasn't refuse matter. The Supreme Court disagreed and held that oil, whether usable or not by industrial eld that oil, whether usable or not by industrial standards becomes both a menace to navigation and a pollutant when discharged into the waters. r the act in question consolidated prior acts which listed various pollutants and did not distin-guish between the discharge of valuable and valueguish between the discharge of valuation and value-less substances into the waters. The term refuse was used to include all foreign substances and pol-lutants, whether of value or not, and thus the avia-tion fuel involved was refuse and proscribed by the Act. (Glickman-Florida) W73-07718

CASPERSEN V. WEST COAST INLAND NAVIGATION DISTRICT (EMINENT DOMAIN PROCEEDING TO ACQUIRE PERPETUAL EASEMENT FOR CANAL).

198 So. 2d 65-68 (2d D.C.A. Fla 1967).

Descriptors: *Florida, *Condemnation, *Judicial decisions, *Legal aspects, *Eminent domain, Water law, Legal review, Water policy, Condemnation value, Easements, Canals, Navigation.

Petitioner navigation district brought suit to acquire by condemnation a perpetual easement to construct and maintain a canal on respondent property owner's land. Respondent contended that the taking was of a fee, and not merely an easement. His expert witnesses testified that the value of the easement taken left no remaining value in the land and thus the practical effect of taking the easement was an appropriation of the fee. The judgment at trial was for petitioner. The District Court of Appeal affirmed the judgment and held that where it appeared that the only restriction upon use of the fee by the owner was that such use should not interfere with the usage of the canal for navigation purposes, it was a jury question as to the remaining value of the fee. Thus, testimony was correctly admitted that allowed petitioner show that the fee had a remaining value, and appellant to show that it did not. It was also a jury question as to whether there was enhancement to the remaining land, but if there was such enhancement in the value shall not be offset against the value of the property appropriated. (Glickman-Florida)

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6F. Nonstructural Alternatives

A STUDY OF FLOODPLAIN DEVELOPMENT AND FLOODPLAIN REGULATIONS. Greater Anchorage Area Borough, Alaska. Planning Dept.

HUD Urban Planning Assistance Grant Report, April, 1972, 32 p, illus, 3 fig. HUD UPAG Alaska P-45.

Descriptors: *Flood protection, *Flood plains, *Regulation, Flood data, Flood forecasting, Flood plain zoning, Flood plain insurance, Flood proofing, *Alaska.

| *Identifiers: *Flood plain management, *Anchorage (Alas), Greenbelts.

The purpose is to explain the need for flood plain management and to propose possible flood plain regulations. The study contains information from flood hazard studies prepared by the Army Corps of Engineers to document the nature of the problem in the Anchorage area, a discussion of the terms involved such as floodway and standard project flood, and the presentation of various elements of a comprehensive flood plain management program, e.g. flood forecasting, floodproofing, flood plain regulations and land development policies, greenbelts along streams, and flood insurance. Also included are discussions of the legal powers to regulate flood plains and the common approaches to formulating such regulations. The study is intended to educate the citizens of the Anchorage area and create public support for flood plain regulations. (Elfers-North Carolina) W73-07175

SUGGESTED FLOOD DAMAGE PREVENTION ORDINANCE WITH COMMENTARY. Northeastern Illinois Planning Commission, Chicago. For primary bibliographic entry see Field 06E. W73-07177

6G. Ecologic Impact of Water Development

PUBLIC SERVICE AND THE PUBLIC UNIVER-SITY: ENVIRONMENTAL PROBLEM-SOL-VING AND RESEARCH, Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 06B. W73-07154

BUFFALO NATIONAL RIVER, ARKANSAS. For primary bibliographic entry see Field 06E. W73-07700

ALEXANDRIA WATERFRONT.
For primary bibliographic entry see Field 06E.
W73-07701

ADMINISTRATION OF THE NATIONAL EN-VIRONMENTAL POLICY ACT, PART II. For primary bibliographic entry see Field 05G. W73-07703

OMNIBUS WATER RESOURCES AUTHORIZA-TIONS--1972, PART 2. For primary bibliographic entry see Field 06E. W73-07704

ECOLOGICAL PERCEPTION: A STUDY OF ADOLESCENT AND PARENTAL ATTITUDES, North Carolina State Univ., Raleigh. Dept. of Sociology and Anthropology. For primary bibliographic entry see Field 06B. W73-07722

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE FORKED RIVER NUCLEAR STATION UNIT 1. Directorate of Licensing (AEC), Washington, D.C. For primary bibliographic entry see Field 05G. W73-07767

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO CONSTRUCTION OF THE WM. H. ZIMMER NUCLEAR POWER STATION. Directorate of Licensing (AEC), Washington, D.C. For primary bibliographic entry see Field 05G. W73-07768

ENVIRONMENTAL RESEARCH LABORATO-RIES IN THE FEDERAL GOVERNMENT AN IN-VENTORY, VOLUME I, Syracuse Univ. Research Corp., N.Y. Policy Inst. For primary bibliographic entry see Field 05G. W73-07772

07. RESOURCES DATA

7B. Data Acquisition

RESULTS OF AERIAL TABULATIONS AND AERO-PHOTOGRAPHS OF SOCKEYE AND THEIR SPAWNING GROUNDS IN THE BASIN OF LAKE KURIL, (IN RUSSIAN), A. G. Ostroumov.

A. O. Ostodumov Lev Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 78: p 17-32. 1970. English summary. Identifiers: *Aerial photography, Basins, Lakes, Photographs, *Sockeye spawning, Tabulations, USSR, *Lake Kuril.

From comparisons of aerial and continuous terrestrial tabulations, an account of the spawning ground of sockeye was arrived at and the maximum depth of spawning was considered. From the air it was possible to take into account an average of about 70% of all fish which passed through a lake. According to data from aerial observation and aero-photography the spawning area covered 1,055,000 m2 including 26% or 270,000 m2 of river spawning grounds, 3% or 30,000 m2 of spring spawning grounds and 71% or 755,000 m2 of lake spawning grounds. The area was 3 times greater than had been calculated in the past. This area could hold 2.5-3 million fish (a number taken as optimal for the given body of water). Each female would be allotted 0.7-0.8 m2.—Copyright 1972, Biological Abstracts, Inc.

DEVELOPMENT OF A SEA-ICE PENETROME-TER, Coast Guard, Groton, Conn. Research and Development Center. For primary bibliographic entry see Field 02C. W73-07250 CALCULATION OF POND SILTING (RASCHET ZAILENIYA PRUDOV), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J. W73-07267

RAPID CALCULATION METHOD FOR ESTI-MATING DILUTION OF EFFLUENTS IN RIVERS, For primary bibliographic entry see Field 05B. W73-07309

MOBILE WATER CONSERVATION LABORATORY,
Gulf Research and Development Co., Pittaburgh,
Pa.
T.J. Puzniak, W. F. Benusa, and J. A. Condron.
In: Water Quality Instrumentation, Vol 1; Selected
Papers from International Symposia presented by
Instrument Society of America: Pittaburgh, Penn,
Instrument Society of America, p 184-190, 1972. 4
fig, 2 tab, 2 ref.

Descriptors: *Laboratories, *Water analysis, *Onsite laboratories, *Water pollution, *Pollutant identification, Water chemistry, Organic compounds, Water quality, Monitoring, Instrumentation, On-site data collections.

A mobile water conservation laboratory is used to perform detailed water quality surveys at various refineries and chemical plants. The laboratory contains a continuous water quality monitor, a total organic carbon analyzer, portable water testing instruments, and laboratory equipment for performing ASTM-APHA tests on industrial waste waters. (Knapp-USGS)

SPECIFIC ION ELECTRODES AS TRANDU-CERS IN CONTINUOUS MONITORING APPLI-CATIONS, Orion Research, Inc., Cambridge, Mass. Div. of Technical Services. For primary bibliographic entry see Field 02K. W73-07400

STABLE ISOTOPE TRACING OF COASTAL SAND TRANSPORT USING DYSPROSIUM OXIDE, Old Dominion Univ., Norfolk, Va. Inst. of Oceanography. For primary bibliographic entry see Field 02L. W73-07401

A COARSE-SEDIMENT TRANSPORT RECORDER (REGISTRATOR DVIZHENIYA KRUPNYKH NANOSOV), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J. W73-07408

HIGH ACCURACY DETERMINATION OF CAL-CIUM IN BLOOD SERUM BY ISOTOPE DILU-TION MASS SPECTROMETRY, National Bureau of Standards, Washington, D.C. Inst. for Materials Research. L. J. Moore, and L. A. Machlan. Analytical Chemistry, Vol 44, No 14, p 2291-2296, December 1972. 5 fig, 7 tab, 12 ref.

Descriptors: *Calcium, *Mass spectrometry, *Methodology, Calcium, Alkaline earth metals, Chemical analysis, Laboratory tests, Separation techniques.
Identifiers: *Isotope dilution, *Precision, *Serum, Thermal ionization, Body fluids.

An isotope dilution technique utilizing thermal ionization mass spectrometry has been developed

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for the accurate determination of calcium in synthetic and serum samples at the 100 micro-grams/g level. Calcium was separated from a serum matrix by destruction of the organic matter with HC104 and HN03 followed by ion-exchange with rictive and rictio solutions and rictive and rictive and rictive separation from interferences using AG 50W-X8 100-200 mesh resin. A mass spectrometric isotopic analysis procedure was developed using a Ca (N03)2 solution deposited on Re sample filaments in a triple filament thermal ion source. The relative calculated and accommendation of the rictive processing the rictive servers between calculated and accommendation. error between calculated and experimentally determined concentrations in synthetic calcium solutions was less than or equal to approximately 0.1 percent. The 95 percent limit of error for a single analysis was approximately 0.2 percent for synthetic and serum samples. A comparison of the isotope dilution data with concurrently determined atomic absorption data from several clinical and independent laboratories is presented. (Holoman-Battelle) W73-07560

DESIGN AND OPERATION OF TEMPERA-TURE-CONTROLLED MULTIPLE ELEMENT ELECTRODELESS DISCHARGE LAMPS FOR ATOMIC FLUORESCENCE SPECTROMETRY, Florida Univ., Gainesville. Dept. of Chemistry. B. M. Patel, R. F. Browner, and J. D. Winefordner. Analytical Chemistry, Vol 44, No 14, p 2272-2277, December 1972. 4 fig. 3 tab, 14 ref.

Descriptors: *Laboratory equipment, *Instrumentation, *Design, *Operations, Mercury, Cadmium, Zinc, Copper, Iron, Magnesium, Germanium, Lead, Temperature, Heavy metals.

Identifiers: *Atomic fluorescence spectroscopy, *Electrodeless discharge lamps, *Multielemental analysis, Indium, Gallium, Thallium, Silver, Tin, Thorium, Uranium, Zirconium, Detection limits, Fluorescent spectra, Chemical interference.

The preparation of multiple-element electrodeless discharge lamps for Hg, Cd, In, Ga, Tl, Zn, Cu, Fe, Mg, Ag, Ge, Sn, Pb, Th, U, and Zr is described. The lamps are excited using a temperature-controlled antenna system. The spectral radi-ant output from each individual element in a multiand output from each insurvous element in a muni-ple-element lamp is very temperature sensitive, but largely uninfluenced by the presence of the other elements (or compounds). Plots of the varia-tion of spectral radiant output with temperature allow the rational choice of a compromise operat-ing temperature for several elements in each lamp. Alternatively, the optimum temperature for each element present may be selected in turn. A comparison is made between the output stability of the multiple-element lamps and the corresponding single-element lamps. Atomic fluorescence detection limits are given, using both multiple-element and single-element lamp sources. (Holoman-Battelle) W73-07563

AUTOMATIC GAP CONTROL UNIT FOR SPARK SOURCE MASS SPECTROMETRY, Virginia Univ., Charlottesville. Dept. of Chemis-For primary bibliographic entry see Field 02K. W73-07620

DUAL CHANNEL SYNCHRONOUS INTEGRA TION MEASUREMENT SYSTEM FOR ATOMIC FLUORESCENCE SPECTROMETRY, Illinois Univ., Urbana. School of Chemical

E. Cordos, and H. V. Malmstadt. Analytical Chemistry, Vol 44, No 14, p 2277-2282, December 1972. 8 fig, 3 tab, 8 ref.

Descriptors: Spectrometers, Spectroscopy, Laboratory equipment, Automation, *Measure-

Identifiers: *Atomic fluorescence spectroscopy, *Synchronous integration measurement system, Sensitivity, Precision.

A dual channel synchronous integration measurement system is described that is easily assemble from standard circuit cards. It has been designed and optimized for application in atomic fluorescence spectrometry, specifically where hol-low cathode tubes are used as excitation source and are operated in an intermittent mode. The test results are presented which show that the percent ndard deviation for the instrument is less than 0.1 percent over a wide dynamic range, the linearity is better than 0.1 percent, and the circuit can accurately subtract background that might cut can accurately subtract background that might exceed the sample by an order of magnitude or more, and it also averages noise over a wide frequency spectrum. The combination of the dual channel synchronous measurement system with the intermittent operation of hollow-cathode tubes provides AF sensitivities that are one to three orders of magnitude greater than by operation in the dc mode. Its usefulness in AF spectrometry is verified by over 1 year of continuous use in an au-tomated instrument. (Holoman-Battelle)

POTENTIOMETRIC TITRATION OF SULFATE USING AN ION-SELECTIVE IRON ELEC-TRODE

Texas Instruments Inc., Dallas.
For primary bibliographic entry see Field 05A. W73-07634

PROBABILITY FORECASTS OF WATER SUR-FACE TEMPERATURES OF THE ST. LAWRENCE RIVER BETWEEN KINGSTON, ONTARIO AND SOREL, QUEBEC, Department of Fisheries and Forestry, Cornwall (Ontario). Water Planning and Operations Branch. For primary bibliographic entry see Field 04A.

W73-07661

THE DETERMINATION OF ICE FORCES ON SMALL STRUCTURES, Acres (H. G.) and Co. Ltd., Niagara Falls (Ontario). Hydraulic Dept. For primary bibliographic entry see Field 02C. W73-07662

HYDROMETRY (GIDROMETRIYA), V. D. Bykov, and A. V. Vasil'yev. Gidrometeoizdat, Leningrad, 1972. 448 p, 71 ref.

Descriptors: *Hydrometry, *Water measurement, *Flow measurement, *Analytical techniques, *Instrumentation, Gages, Gaging stations, Water levels, Floats, Stage-discharge relations, Discharge (Water), Sediment discharge, Sediments, Currents (Water), Waves (Water), Water properties, Ice, Aerial photography, Computers, Equations. Identifiers: *USSR, Bathometers, Turbidimeters,

Techniques and equipment used in the measure-ment of water levels, depths, flow velocities, and water and sediment discharges, and in the investigation of currents, waves, water temperature, and ice are described in this third, revised and enlarged edition approved by the USSR Ministry of Higher and Secondary Specialized Education for use as a textbook at state universities and hydrometeorological institutes. The application of aerial photography to the field of hydrometry is examined together with the development of auto-matic instrumentation for hydrologic measure-ment and the introduction of electronic computers to the solution of hydrologic problems. (Josefson-IISGS)

USE OF AERIAL PHOTOGRAPHS IN MUD-FLOW INVESTIGATIONS (AEROMETODY IZUCHENIYA SELEY), All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR). A. V. Sadov.

Izdatel'stvo 'Nedra', Moscow, 1972, 127 p.

Descriptors: *Aerial photography, *Analytical techniques, *Mudflows, *Erosion, *Mass wasting, Avalanches, Landslides, Solifluction, Talus, Weathering, Rocks, Soils, Vegetation, Glaciers, Snowpacks, Geology, Engineering geology, Geomorphology, Orography, Hydrology, Identifiers: *USSR, Mudflow hazard, Therbuttifiers: *USSR, Mudflow hazard, Therbuttifiers. mokarst, Tectonics.

Principles of aerial photographic interpretation were applied to geologic-engineering investigations of mudflows in mountainous areas of Zailiski Ala Tau, Altay Territory, Uzbekistan, and Transbaykal. On the basis of aerial photographs, the role and importance of hydrological, geomorphological, geological, soil-vegetal, and anthropogenic factors in the formation of mudflows were investigated for mudflow-hazard evaluation and development of mudflow-control measures. (Josefson-USGS) W73-07683

EXPERIMENTAL INVESTIGATION OF TURBULENT DIFFUSION IN THE SEA BY THE FLUORESCENT TRACER METHOD, For primary bibliographic entry see Field 08B. W73-07688

ELECTRICAL INSTRUMENT FOR DETERMIN-ING WATER-FLOW CONDITIONS, For primary bibliographic entry see Field 08B. W73-07689

WAVE RESONANCE NEAR SHORES, Wisconsin Univ., Madison. Dept. of Mathematics. For primary bibliographic entry see Field 02E. W73-07724

7C. Evaluation, Processing and Publication

DYNAMIC COMPUTER SIMULATION AND CONTROL METHODS FOR WATER DISTRIBUTION SYSTEMS, General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div. For primary bibliographic entry see Field 04A. W73-07165

SEDAN--A COMPUTER PROGRAM FOR SEDI-MENT PARTICLE-SIZE ANALYSIS, Department of the Environment, Ottawa (On-tario). Inland Waters Branch. For primary bibliographic entry see Field 02J. W73-07234

SOME SEASONAL VARIATIONS OF THE ICE COVER IN THE BEAUFORT SEA: EVIDENCE OF MACROSCALE ICE DYNAMICS OF MACROSCALE ICE DYNAMICS PHENOMENA,
National Environmental Satellite Service,
Washington, D.C.
For primary bibliographic entry see Field 02C.
W73-07241

MAPPING THE UNDERSIDE OF ARTIC SEA ICE BY BACKSCATTERED SOUND, Wisconsin Univ., Middleton. Geophysical and Polar Research Center. For primary bibliographic entry see Field 02C. W73-07242 GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1969-1970, Geological Survey, Oklahoma City, Okla. For primary bibliographic entry see Field 04B. W73-07254

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WATER RESOURCES DATA FOR KANSAS, 1971: PART 2. WATER QUALITY RECORDS. Geological Survey, Lawrence, Kans.

Available from USGS, WRD, 1950 Avenue A, Campus West, Lawrence, Kans. 66044 Geological Survey Data Report, 1972. 140 p, 2 fig, 4 tab, 20

Descriptors: "Water resources, "Water quality, "Surface waters, "Groundwater, "Kansas, Basic data collections, Chemical analysis, Sampling, Water analysis, Streamflow, Discharge measurement, Sediment yield, Water wells, Water chemis-

Water-resources data for the 1971 water year for Kansas include records of data for the chemical and physical characteristics of surface water and groundwater. Data on surface water (chemical, microbiological, temperature, stream discharge, and sediment) were collected from sampling sites at predetermined intervals such as once daily, weekly, monthly, or less frequently. Records are given for 66 surface-water sites and 46 groundwater sites. Becords for pertinent water-coulding given for 66 surface-water sites and 46 ground-water sites. Records for pertinent water-quality stations in bordering states are also included. These data represent that portion of the National Water Data System collected by the U.S. Geologi-cal Survey and cooperating State and Federal agencies in Kansas. (Woodard-USGS) W73-07255

CALCULATION OF THE COMPETENCE OF AN ICE-COVERED STREAM (RASCHET TRANSPORTIRUVUSHCHEY SPOSOBNOSTI POTOKA, POKRYTOGO L'DOM), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02J. W73-07260

THE LITTORAL POWER GRADIENT AND SHORELINE CHANGES. Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology. For primary bibliographic entry see Field 02J. W73-07317

WASTEWATER COLLECTION NETWORK DESIGN BY GEOMETRIC PROGRAMMING, Massachusetts Inst. of Tech., Cambridge. For primary bibliographic entry see Field 05D.

SYSTEMS ANALYSIS: WHAT CAN IT DO. Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 06A. W73-07369

THE USE OF SYSTEMS ANALYSIS IN WATER RESOURCES DEVELOPMENT. For primary bibliographic entry see Field 06A. W73-07379

OCEANOGRAPHIC OBSERVATIONS IN MON-TEREY BAY, CALIFORNIA, FEBRUARY 1971 TO DECEMBER 1971, Moss Landig Marine Labs., Calif. W. W. Broenkow.

Available from NTIS, Springfield, Va 22151 as COM-72 11122 Price \$3.00 printed copy; 95 cents microfiche. Technical Publication 72-1, 1972. 205 p. 1 fig, 284 tab, 11 ref. NOAA Grant No 2-35137.

Descriptors: *Oceanography, *Bays, *California, *Water quality, *Water analysis, Water circulation, Tidal effects, Currents (Water), Mixing, Chemical analysis, Biological properties, Path of pollutants, Sewage, Salinity, Phosphates, Nitrates, Water temperature, Data collections, Sampling, Analytical techniques.

Identifiers: *Monterey Bay (Calif).

A study of the hydrography of Monterey Bay, California was begun in February 1971 to determine seasonal and small scale spatial variations in some physical, chemical and biological parameters. Data were obtained to determine the relative influences of the transport of offshore waters through the bay, the discharges of domestic sewages into the bay, and the biochemical changes that occur within the bay. When the shoreline was clearly visible, station positions were determined using horizontal sextant angles with an accuracy of about plus minus0.1 mile within 1 mile of shore and plus minus0.3 mile within 6 miles of shore. During inclement weather a combination of loran, radar ranges and bearings and fathometer readings were used, and in most cases the accuracy of the position was about plus minus0.5 mile or better. Water samples were collected at 21 sites at depths ranging from 0 to 400 meters. The pertinent data are tabulated. (Woodard-USGS) W73-07382

CHEMICAL QUALITY OF WATER IN CANO TIBURONES, PUERTO RICO: A RECONNAIS-SANCE STUDY CARRED OUT IN 1967, Geological Survey of Puerto Rico, San Juan.

Geological Survey open-file report (Map Series No 2), 1973. 2 sheets, 1 map, 2 tab.

Descriptors: *Water quality, *Chemical analysis, *Surface water, *Groundwater, *Puerto Rico, Saline water intrusion, Aquifers, Aquifer characteristics, Freshwater, Sea water, Saline waterfreshwater interfaces, Canals, Drainage practices, Rainfall, Runoff, Basic data collections.

Identifiers: *Cano Tiburones (P.R.), Marine

The U.S. Geological Survey made a reconnaissance of the chemical quality of water in Cano Tiburones, Puerto Rico, during October and November 1967. The reconnaissance had two objectives: to investigate the extent of the salinity of the water in the Cano and to identify locations of sea-water intrusion. The Cano Tiburones is a former marine slough, approximately 9 square miles, on the north coast of Puerto Rico. Much of the land surface lies below sea level, and, for the most part, the water table is at the same elevation. as the water in the canals. Hundreds of springs dot the area, with quality ranging from that of slightly diluted sea water to that of fresh water. The fresh diluted sea water to that of fresh water. The fresh water is of a calcium bicarbonate type. Chloride ranges from 50 mg/liter in surface runoff to 500 mg/liter in some springs and in wells drilled more than 100 feet in the Aymamon Limestone. Sulfate is present in small amounts except in water from cemented sand dunes and lagoonal deposits, where it ranges from 100 to 200 mg/liter. Dissolved solids, of which silica represents about 5 percent, do not usually exceed 1,000 mg/liter. (Woodard-USGS)
W73.07383 W73-07383

FLOODS IN MARENGO SOUTH QUADRAN-GLE, NORTHEASTERN ILLINOIS, Geological Survey, Washington, D.C.

H. E. Allen. For sale by USGS, Washington, D C 20242 Price 75 cents. Geological Survey Hydrologic Investigations Atlas HA-463, 1972. 1 sheet, 15 fig, 1 map.

Descriptors: *Floods, *Flood data, *Flood discharge, *Flood frequency, *Illinois, Hydrologic data, Flood control, Flood plains, Flow rates,

Peak discharge, Streamflow forecasting, Flood profiles, Basic data collections. Identifiers: *Marengo south quadrangle (III), Northeastern Illinois

Northeastern Illinois.

This atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Marengo South quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the ground-water resources. The areas inundated by floods slong streams in the Marengo South quadrangle are delineated on a topographic map. The stream names and the dates of the floods are tabulated. Local residents reported that the flood of August 1968 was the highest observed in the last 20 years on Coon Creek and Harmony Creek. (Woodard-USGS) USGS) W73-07384

FLOODS IN HAMPSHIRE QUADRANGLE, NORTHEASTERN ILLINOIS, Geological Survey, Washington, D.C. R. T. Mycyk, and M. D. Duerk. For sale by USGS, Washington, D C 20242 Price 75 cents. Geological Survey Hydrologic Investiga-tions Atlas HA-459, 1972. 1 sheet, 10 fig, 1 map, 1

Descriptors: "Floods, "Flood data, "Flood discharge, "Flood frequency, "Illinois, Hydrologic data, Flood control, Flood plains, Flow rates, Peak discharge, Streamflow forecasting, Flood profiles, Basic data collections.

Identifiers: "Hampshire quadrangle (III), Northeastern Illinois.

This atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flooding that affect the economic development of flood plains in the Hampshire quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving the existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the ground-water resources. The approximate areas inundated by floods along streams in the Hampshire quadrangle are delineated on a topographic map. Inundated areas for the flood of August 1968 are shown along Coon Creek, Burlington Creek, West Branch Burlington Creek, Hampshire Creek tributary, Virgil ditch No. 3, and several unnamed streams. The floods of February 1938 on Hampshire Creek and Coon Creek were reported by local residents to be the highest observed in the past 46 years. (Woodard-USGS) W73-07385

AN INTRODUCTION TO FINITE DIFFERENCE METHODS AS APPLIED TO GROUNDWATER

METHODS AS APPLIED TO GROUNDWA! PROBLEMS. Nebraska Univ., Lincoln. Dept. of Geology. For primary bibliographic entry see Field 02A. W73-07434

ANALOG MODELS, Nebraska Soil and Water Conservation Commis-For primary bibliographic entry see Field 02A. W73-07435

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

SIMULATION OF GROUNDWATER SYSTEMS. Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-0743

ON THE NEED FOR A SYSTEM OPTIMIZA-

TION LABORATORY, Stanford Univ., Calif. Dept. of Operations

For primary bibliographic entry see Field 06A. W73-07440

NUMERICAL ANALYSIS OF FLOW IN LAVER

CULTURE FARM, National Research Institute of Agricultural En-gineering, Hiratsuka (Japan). Div. of Fisheries Enneering.

gineering. For primary bibliographic entry see Field 02E. W73-07528

WATER RESOURCES DATA FOR TEXAS, 1970: PART 2. WATER QUALITY RECORDS. Geological Survey, Austin, Tex.

Available from USGS, Federal Bldg., 300 East 8th Street, Austin, Tex 78701. Geological Survey Data Report, 1973. 714 p, 4 tab, 20 ref.

Descriptors: "Water quality, "Surface waters, "Chemical analysis, "Physical properties, "Texas, Water temperature, Sediment transport, Suspended load, Sediment yields, Streamflow, Flow rates, Inorganic compounds, Water chemistry, Dissolved solids, Hydrogen ion concentration, Basic data collections, Sampling, Methodology. Identifiers: 1970 water year

Water resources data for the 1970 water year for Texas include records of data for the chemical and physical characteristics of surface water. These data represent that portion of the National Water stem collected by the U.S. Geological Sur-Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. The description of the sampling station gives the location, drainage area, periods of record for the various water-quality data, extremes of the pertinent data, and general remarks. The daily chemical quality data generally represent equalvolume composites for 2- to 30-day periods; the composite periods are selected on the basis of specific conductance of the daily samples and specific conductance of the daily samples and fluctuation of water discharge. Water temperatures were measured at most of the water-quality stations. Suspended-sediment concentrations were determined from samples collected by using depth-integrating samplers. During periods of rapidly changing flow or rapidly changing concentration, suspended-sediment samples may have been collected twice daily or, in some instances, hourly, (Woodard-IUSGS) hourly. (Woodard-USGS) W73-07545

A USER'S MANUAL FOR THREE-DIME-NSIONAL HEATED SURFACE DISCHARGE COMPUTATIONS,

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-07546

ON-LINE COMPUTER CONTROLLED MULTI-PLE ION DETECTION IN COMBINED GAS CHROMATOGRAPHY MASS TROMETRY,
Michigan State Univ., East Lansing. Dept. of

Biochemistry.

J. R. Holland, C. C. Sweeley, R. E. Thrush, R. E.

Teets, and M. A. Bieber. Analytical Chemistry, Vol 45, No 2, p 308-314, February 1973. 6 fig, 4 tab, 18 ref.

Descriptors: *Automatic control, *Pollutant

Descriptors: "Automatic control, "Pollutant identification, "lons, "Computers, Chemical analysis, Organic compounds, Data collections, Stable isotopes, Isotope studies, Automation Instrumentation, Computer programs.

Identifiers: "GC-Mass spectrometry, "On-line systems, "Accelerating voltage alternation, Precision, Perfluorokerosene, Digital-to-analog converters, Analog-to-digital converters, Prostaglandin, Mass spectra, Reproducibility, Detection limits, Fatty acids.

A system is described for on-line data collection A system is described for on-line data collection and automated ion focusing of a single focusing magnetic deflection mass spectrometer equipped with gas chromatographic inlet and accelerating voltage alternator. A special interface consisting of an ion current amplifier, analog-to-digital converter, computer, digital-to-analog converter, and verter, computer, angual-to-analog converter, and dipolar power supply permits an offset voltage to be added to or subtracted from the accelerating voltage under computer control. These units, together with two status registers, provide a control loop for continuous fine adjustment of the accelerating voltage in order to maintain optimal celerating voltage in order to maintain optimal focusing on each of several ions selected by coarse sequential switching of the accelerating voltage. Tests of the system were performed in a static mode with perfluorokerosene and in a dynamic mode with several componds introduced by the gas chromatographic inlet, including mixtures of fatty acid methyl esters, the tetra-O-acetyl methyl strengths of places and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse and (6.6.2 acid. 2) elected the coarse acid. osides of glucose and (6,6-2 sub 2)-glucose, glycosides of glucose and to,0-2 sun Lygueuse, and the O-acetyl methyl esters of prostaglandin PGF sub 2 alpha and (3,3,4,4-2-H sub 4)PGF sub 2 alpha. The additional capabilities of continous ion focusing during the gas chromatographic run and precise selection of integration parameters in the computer-assisted data reduction process enabled stable isotopic abundance measurements to be made with a precision of less than 1 percent on samples as small as 100 ng. (Holoman-Battelle)

COMPUTER IDENTIFICATION OF MASS SPECTRA USING HIGHLY COMPRESSED

Jet Propulsion Lab., Pasadena, Calif. S. L. Grotch.

Analytical Chemistry, Vol 45, No 1, p 2-6, January 1973, 2 fig. 2 tab.

Descriptors: *Pollutant identification, *Computer programs, *Data storage and retrieval, Digital computers, Data processing, Mass spectrometry, Data collection Identifiers: *Mass spectra, *Minicomputers.

In file search methods, storage is often a signifi-cant problem, particularly with mini-computers. Spectral abbreviation alleviates the problem by coding only 2 peaks/14 amu. This concept may be further exploited by noting that the mass position of any peak in a 14-amu window may be coded using only four bits. For nearly 7000 spectra in the Aldermaton collection this code requires an Aldermaston collection, this code requires an average of 48 bits/spectrum. Tests indicate that average of 40 bits/spectrum. Tests muchae that this code is highly specific, and with appropriate matching algorithms will produce very effective identifications. Further improvements in identifi-cation accuracy are obtained when two bits of incation accuracy are obtained when two bits of in-tensity information are added to the peak position. Using an IBM 360/44, a 7000-spectra library can be searched in less than 10 seconds. Since most com-puters now manufactured have word sizes which are multiples of four bits, this technique should lend itself. well to most machines. (Little-Battelle) W73-07629

DROUGHT IMPACT ON REGIONAL ECONO-

MY, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 06B. W73-07640

TECHNIQUES FOR ASSESSING HYDROLOGICAL POTENTIALS IN DEVELOPING COUN-TRIES.

Agency for International Development, Washington, D.C. Office of Science and Technology.

Report TA/OST 73-17, January 1973. 66 p, 78 ref.

Descriptors: *Water resources development, *Foreign countries, *Potential water supply, *Technology, Governments, *Perviews, Developed waters, Correlation analysis, Hydrologic data, Streamflow, Erosion, Sediment transport, Groundwater movement, Precipitation (Atmospheric), Evaporation, Remote sensing, Planning, Water demand. Identifiers: *Developing countries, State of the art

This report was prepared in connection with activities of the Planning Group on Science, Technology, and Development established by the Organization for Economic Cooperation and Development. It is intended to serve as a basis for evaluating the current state of the art and research religible to the chain of the contraction of the cont evaluating the current state of the art and research priorities with respect to techniques for assessing hydrological potentials in developing countries. The report is based in large part on a preliminary analysis prepared by the U.S. Geological Survey for the Agency for International Development. This preliminary report was subsequently modified and supplemented as the result of comments solicited from numerous reviewers in U.S. Government agencies and universities, other decory countries and international development in donor countries, and international development in-stitutions. Current capabilities and future needs summons. Current capabilities and future needs are described for assessing hydrological potentials under the topical headings: Streamflow, Erosion and Sediment Transport, Water Movement in Unsaturated Soils, Groundwater, Precipitation, Evaporation, and Hydrologic Applications of Remote Sensing. (See also W72-11672) (Woodard-USGS) USGS) W73-07667

DIGITAL SIMULATION OF AN OUTWASH

AQUIFER, Nova Scotia Dept. of Mines, Halifax. For primary bibliographic entry see Field 02F.

SELECTED HYDROLOGIC DATA, LOWER BEAR RIVER DRAINAGE BASIN, BOX ELDER COUNTY, UTAH, Geological Survey, Salt Lake City, Utah. L. J. Bjorkhund, and L. J. McGreevy. Utah Department of Natural Resources Basic-Data Release No 23, 1973. 22 p, 1 fig, 5 tab, 4 ref.

Descriptors: *Groundwater resources, *Water wells, *Springs, *Basic data collections, *Utah, Hydrologic data, Well data, Water levels, Obser-vation wells, Drillers logs, Aquifers, Water qualivation webs, Differs 10gs, Adulters, Water qual-ty, Chemical analysis. Identifiers: *Lower Bear River basin (Utah), *Box Elder County (Utah).

Selected basic data are presented from a study of the groundwater resources of the lower Bear River drainage basin, Box Elder County, Utah. The study was made during 1970-72 by the U.S. Geological Survey in cooperation with the Utah Department of Natural Resources, Division of Water Rights. Incorporated are data collected by the Geological Survey and by other organizations since 1935. The data are presented in five tables: (1) Records of selected wells, (2) Records of selected wells, (2) Records of selected wells, (3) Records of selected wells, (3) Records of selected wells, (4) Records of selected wells, (5) Records of selected wells, (6) Records of selected wells, (6) Records of selected wells, (6) Records of selected wells, (6) Records of selected wells, (7) Records of selected wells, (8) Rec to, necestral of selected wells, (2) Records of selected springs, (3) Water levels in selected observation wells, (4) Selected driller's logs of wells, and (5) Chemical analyses of water from selected wells and springs. (Woodard-USGS) W73-07679

PROBLEMS IN THE STUDY AND UTILIZA-TION OF WATER RESOURCES (PROBLEMY

IZUCHENIYA I ISPOL'ZOVANIYA VODNYKH RESURSOV). For primary bibliographic entry see Field 04A. W73-07680

HYDROMETRY (GIDROMETRIYA), For primary bibliographic entry see Field 07B. W73-07682

THE DENVER SYSTEM OF WATER WORKS CONTROLS, Denver Dept. of Water, Colo. For primary bibliographic entry see Field 08C. W73-07692

APPLYING MODERN MANAGEMENT TECHNIQUES TO A WATER POLLUTION CONTROL PROGRAM, NEW YORK CITY, New York City Dept. of Public Works. Bureau of Water Pollution Control. For primary bibliographic entry see Field 05G. W73-07695

08. ENGINEERING WORKS

8A. Structures

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WATER WELL STANDARDS: STATE OF CALIFORNIA. California State Dept. of Water Resources, Sacramento.

Chapter II and Append E, F, and G from Bulletin No 74, Feb 1968, Reprinted January 1971. 31 p, 3 fig, 5 tab, 3 appendices.

Descriptors: Wells, *Water wells, *Standards, California, Well casing, *Well regulations, Well spacing, Water quality, Groundwater, Grouting, Sealants, Disinfection, *Specifications. Identifiers: Definitions, *Sanitary protection, Abandonment (Wells), Annular space.

The standards presented are guides to good practice for those engaged in the construction of water wells and the destruction of abandoned wells. The need is fulfilled for a basic set of standards that are satisfactory under most conditions and which can be modified or expanded to accommodate local variations in geologic or ground water conditions. Under certain circumstances, adequate protection of ground water quality may require more stringent standards than those presented; under other circumstances, it may be necessary to deviate from the standards or substitute other measures which will provide protection equal to that provided by the standards given. Provision has been made for deviation from the standards as well as for addition of appropriate supplementary standards. Aspects of well regulation covered include well location, sealing, surface construction features, disinfection, well casing, well development, sampling, repair of wells, and abandonment of wells. (Campbell-NWWA)

STANDARDS FOR CONSTRUCTION OF FRIVATE WATER WELLS. Indiana State Board of Health, Indianapolis.

Bulletin No S.E. 15, January 1966. 18 p, 3 fig, 4

Descriptors: Wells, *Water wells, Standards, Indiana, Well casing, *Well regulations, Water quality, Grouting, Disinfection, Sampling, Groundwater, *Specifications, Domestic water.

Identifiers: Rock aquifers, Abandonment (Wells).

To guide drillers and owners in the construction and purchase of safe, usable wells, these standards for the construction and installation of wells and pumps are recommended. In addition to prescribed minimum distances from sources of contamination, the location of a well should be consistent with the following principles: (a) It should be located at the highest point on a property consistent with the general layout and surroundings, and (b) it should be protected naturally or by grading from surface drainage and flooding. Casing is recommended to be of wrought iron, steel, or type K copper of adequate thickness and is advised to extend to at least 25 feet below ground surface. Minimum standards of dimensions and weights of various types of casing are given, along with grouting and sealing procedures, and reasons for these procedures. In the interest of aquifer protection, the use of wells for the disposal of sewage or other material that may contaminate potable water horizons is prohibited. Pump installation and disinfection are also covered. (Smith-NWWA).

RURAL WATER SUPPLY. New York State Dept. of Health, Albany. For primary bibliographic entry see Field 04B. W73-07340

RECOMMENDED STANDARDS FOR PREPARATION OF WATER WELL CONSTRUCTION SPECIFICATIONS. Associated Drilling Contractors, Sacramento, Calif. Specifications Committee.

1960, 32 P. 4 FIG. 5 TAB. Price: \$1.50.

Descriptors: Wells, Water wells, *Specifications, *Standards, *Construction, Materials, Drilling, Rotary drilling, California, Contracts, Disinfection, Water quality, *Well permits, Legal aspects. Identifiers: Cable tool drilling, Well location.

A guide is given for use by engineers and others responsible for the preparation of specifications for the construction of water wells. The scope of the work covered includes the furnishing of all labor, material, transportation, tools, supplies, and plant equipment and appurtenances necessary for the complete and satisfactory construction, testing, and disinfection of a water supply well. In the construction of wells the intention should be to produce a safe water. This aim can be normally realized if, in selecting the well site, due consideration is given to possible sources of contamination in surrounding areas and proper attention is paid to casing, grouting, and surface protection. Separate sections discuss cable tool or percussion drilled wells, and rotary gravel envelope wells. (Campbell-NWWA)

RULES AND REGULATIONS GOVERNING DRILLING OF WELLS AND APPROPRIATION AND USE OF GROUND WATER IN NEW MEX-ICO.

New Mexico State Engineer. Santa Fe.

Report 1966, 124 p.

Descriptors: Drilling, Wells, "Water wells, "New Mexico, Groundwater, Groundwater resources, Specifications, Regulation, Permits, "Well regulations, Construction, Well casing, Artesian wells, Cement grouting, Drill holes, Maps. Identifiers: "Licensing, Rehabilitation (Wells), Well location, Abandonment (Wells), Plugging (Wells).

The rules and regulations presented are formulated for the purpose of carrying out provisions of statutes governing ground waters and describing the present extent of all declared ground water basins in the state of New Mexico. These rules and regulations apply only to use of water within declared ground water basins. Outside such declared ground water basins, wells may be drilled for beneficial uses without the appropriator making application to the State engineer, subject only to prior and existing rights within such areas. Subject areas treated in detail are: declaration and initiation of water rights; change of well location, supplemental wells, prerequisites for drilling, and deepening and repairing; hearings; well drillers licensing, construction, repair and plugging of wells; maps and plans; forms and fees; and declared underground water basins. (Smith-NWWA)

STANDARDS FOR PLASTIC PIPING, Plastics Pipe Inst., New York. Por primary bibliographic entry see Field 08G. W73-07343

RECOMMENDED STANDARDS FOR PREPARATION OF WATER WELL CONSTRUCTION SPECIFICATIONS, Minnesota Water Well Association, St. Paul.

Price \$1.50, 1967, 27 p 5 fig.

Descriptors: Specifications, *Standards, Wells, *Water wells, Disinfection, Grouting, Cement grouting, *Construction, Contracts, Bids, Well casings, Water sampling, Water supply development.

Identifiers: Sanitary protection, Abandonment (Wells).

An industry approved guide for use by engineers and others responsible for the preparation of specifications for construction of water wells is given. Specifications for the furnishing of all labor, material, transportation, tools, supplies, plant equipment, and appurtenances necessary for the complete and satisfactory construction, disinfection and testing of a proposed water supply well are shown. It is emphasized that the intention of well construction is to produce safe water and that this aim can normally be realized if, in selecting the well site, due consideration is given to possible sources of contamination in the surrounding area and proper heed is paid to casing, grouting and surface protection. Points to be considered in designing and writing the description of the well are set forth in the first section. Applicable rules of the state health department should be studied with regards to well construction. The second section deals with suggestions to engineers with regard to water well specifications, and the last section, with general specifications for water wells. (Smith-NWWA)

LEAST COST PIPE NETWORK DERIVATION, University Coll., London (England). Dept. of Civil and Municipal Engineering. For primary bibliographic entry see Field 04A. W73-07375

WATER WELL TECHNOLOGY, National Water Well Association, Columbus, Ohio. Research Facility. M. D. Campbell, and J. H. Lehr. McGraw-Hill, New York, N.Y., 1973. 681 p, 159 fig, 40 tab, 673 ref, append, Glossary, Index. Price \$24.50. OWRR W-124 (1).

Descriptors: Wells, "Water wells, Well casings, Well screens, Construction, Groundwater, Groundwater availability, Water quality, "Drilling, Rotary drilling, Drilling equipment, Driller's Soy, Logging (Recording), "Corrosion, "Water supply development, Pollution abatement, Oil industry, Mining, Rock properties, "Economics, Construction costs, Maintenance.

Field 08—ENGINEERING WORKS

Group 8A—Structures

Identifiers: "Well construction, Cable-tool drilling, Ground water pollution, Drillability, Formation evaluation, Well hydraulics, Cost analysis, Incrustation

As society demands larger and larger quantities of fresh, potable water, the utilization of ground water takes on increasing importance. For this in-vestigation, water well construction technology has been defined to include all technological feahas been defined to include an technological rea-tures which relate to drilling, completing, develop-ing, and maintaining water wells of various capaci-ties for a variety of large and small domestic and industrial purposes in both consolidated and un-consolidated formations. Current methods for extracting ground water by means of wells are reviewed, with incorporation of technology being reviewed, with incorporation of technology being used in the petroleum, mining and ground water industries. Principles of operation and concepts behind the petroleum and mining industries techniques are examined for possible reapplication to the ground water industry. The major factors of well construction technology are treated in suffi-cient detail to delineate the techniques and problems as well as the benefits to be derived by the ground water and mineral exploration indus-tries. Specific topics covered include: ground tries. Specific topics covered include: ground water pollution; rock drillability, cable-tool, rotary, variations of common drilling systems, new and future drilling systems; formation and identification and evaluation; and well hydraulics, design, construction, efficiency, maintenance and cost analysis. (Smith-NWWA) W73-07416

ECOLOGY, ENERGY, AND ECONOMY, Carrier Air Conditioning Co., Syracuse, N.Y. For primary bibliographic entry see Field 05G. W73-07480.

DESIGNING OPTIMUM COOLING SYSTEMS. GKN Birwelco Ltd., Birmingham (England). For primary bibliographic entry see Field 05D.

WALLACE DAM, Georgia Power Co., Atlanta. M. H. Thompson, Jr. Journal of the Power Division, American Society of Civil Engineers, Vol 98, No PO2, p 333-348, Oct

engineering, "Recreation, Pump turbines, Hydroelectric power, Project feasibility, Planning, Recreation facilities, Hydroelectric project licensing, Model studies, Drawdown, Hydraulic models, Economics, Concrete dams, Gravity dams, Costs, Design, Conservation, Wildlife, Relocation.

Identifiers: Wallace Dam (Georgia), *Low head.

Wallace Dam, Georgia Power Company's first pumped storage project, is one of the first low-head (less than 100 ft) main river pumped storage projects considered feasible. Many phases and en-gineering problems involved, such as the project history, location, size, cost, and economics, are history, location, size, cost, and economics, are presented. Difficulties in obtaining an FPC license and the economical justification for a low-head pumped storage project are explained. Plans for recreation and recreational facilities are discussed recreation and recreational racinities are discussed and concern for wildlife preservation and other ecological effects is expressed. Unique features of the pump turbines, the 1- to 2-ft maximum yearly drawdown of the reservoir, and the tailrace design are reviewed. The need and usefulness of hydraulic model studies are stressed. The potential for at-tracting new industry and development of new communities is recognized. (USBR) W73-07554

DRAINAGE OF AGRICULTURAL LAND, PRACTICAL HANDBOOK FOR T

PLANNING, DESIGN, CONSTRUCTION AND MAINTENANCE OF DRAINAGE SYSTEMS. Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04A. W73-07658

A MATHEMATICAL MODEL FOR PRELIMI-NARY EVALUATIONS OF CANDIDATE RESERVOIR SYSTEMS, Army Engineer Waterways Experiment Station,

Vicksburg, Miss. J. L. Decell.

Sponsored by U.S. Army Engineer District, Pitt-sburgh. Technical Report M-72-3, August, 1972. 42

Descriptors: *Reservoirs, *Mathematical models, *West Virginia, *Cost analysis, *Construction costs, Flow augumentation, *Reservoir design. Identifiers: *Rowlesburg Reservoir (W. Va), Reservoir capacity, Flood storage.

A mathematical model system was developed to provide an expedient method of evaluating can-didate reservoirs. The models can be used to per-form both functional and cost evaluations. These evaluations can then be used for comparisons of candidate reservoirs. The formulation of the models and data requirements to evaluate alternate candidates to the Rowlesburg Reservoir, West Virginia, are discussed. Examples of analyses of reservoir capacity, flood storage-flow augmentation, and visitation are presented in an endix. (WES)

8B. Hydraulics

COMPUTER SIMULATION OF DESIGN CRITERIA FOR URBAN FLOW STORAGE SYSTEMS, Hydrocomp International, Palo Alto, Calif.

For primary bibliographic entry see Field 04A. W73-07163

REOXYGENATION IN OPEN CHANNELS: DIF-FUSION MECHANISM, Politecnico di Torino (Italy). Instituto di Chimica

Industriale. For primary bibliographic entry see Field 05G.

W73-07201

FLOOD SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 02E. W73-07252

COASTAL GEOMORPHOLOGY. For primary bibliographic entry see Field 02J. W73-07315

DEPOSITIONAL STRUCTURES AND PROCESSES IN THE MOUTHS OF SMALL COASTAL STREAMS, SOUTHWESTERN OREGON. Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02J. W73-07322

MORPHOLOGY AND VERTICAL SEDIMENTA-RY SEQUENCE MODELS IN HALOCENE TRANSGRESSIVE BARRIER SYSTEMS, Delaware Univ., Newark. Dept. of Geole For primary bibliographic entry see Field 02J.

WATER WELL TECHNOLOGY. National Water Well Association, Columbus, Ohio. Research Facility.
For primary bibliographic entry see Field 08A.

NEW CRITERIA FOR FIRE PROTECTION OF LARGE AIR FORCE WAREHOUSES, VOLUME II, FRICTION LOSS IN PIPES: MINIMIZATION BY THE USE OF CHEMICAL ADDITIVES, Factory Mutual Research Corp., Norwood, Mass. D. E. Breen, and D. G. Goodfellow.

Available from the National Technical Informa-tion Service as AD-874 998, \$3.50 in paper copy, \$0.95 in microfiche. Technical Report No AFWL-TR-70-1 Vol II, August, 1970. 18 p. 6 fig, 1 tab, 11

Descriptors: *Polymers, *Turbulent flow, *Turbu-lence, *Turbulent boundary layers, Friction, Pipes, Pipe flow, Reynolds number, Mixing. Identifiers: Friction loss reduction.

Water additive solutions were tested for relative effectiveness in reducing friction loss in turbulent flow. In a comparison of five candidate additives, Polyox FRA and Separan AP 273 were judged su-Polyox FRA and Separan AP 273 were judged su-perior in performance. A maximum increase of 2.5 in flow rate factor was attained in a simple gravity speed system. A subsequent test of Polyox FRA in a simulated sprinkler system showed no significant change in flow. This failure is believed to be due to faulty mixing. Methods to overcome this experi-mental difficulty are recommended. (Smith-Texas) W73-07474

DISCUSSION OF: 'TWO DIMENSIONAL SUR-FACE WARM JETS', Hydraulics Research Station, Wallingford (En-

gland).
For primary bibliographic entry see Field 05B.
W73-07484

DISCUSSION OF: 'TWO DIMENSIONAL SUR-

FACE WARM JETS', Tennessee Valley Authority, Norris. Engineering For primary bibliographic entry see Field 05B. W73-07485

CONTROL OF SILTING IN RESERVOIRS ON MOUNTAIN RIVERS,
Politekhnicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 04D.

CALCULATION OF THE PROCESS OF SEDI-MENTATION AND HYDRAULIC WASHOUT OF RIVER RESERVOIR,

Akademiya Nauk Armyanskoi SSR, Erevan. In-stitut Agrokhimicheskikh Problem i Gidroponiki. For primary bibliographic entry see Field 02J. W73-07502

VARIATIONS IN THE SOLID DISCHARGE ALONG THE LENGTH OF THE SEDIMENTA-TION ZONE DURING SILTING OF RESER-VOIRS,

Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR). For primary bibliographic entry see Field 02J. W73-07503

STUDIES OF STORAGE WORK SILTING OF HYDROELECTRIC POWER PLANTS ON MOUNTAIN RIVERS AND SILT DEPOSITION FIGHTING. bibliographic entry see Field 02J.

PROTECTION OF OFFTAKE WORKS
AGAINST SILTING-UP, CALEDON-WELBEDACHT DAM,
Department of Water Affairs, Pretoria, (South
Africa). Design Div.
For primary bibliographic entry see Field 02J.
W73-07507

MEANS OF PREVENTING LOSS OF RESERVOIR CAPACITY THROUGH SEDIMENTA-

Connecticut Univ., Storrs. For primary bibliographic entry see Field 02J. W73-07508

A PROPOSED MEASURE FOR PREVENTION OF VORTEX IN THE ASPIRATOR OF A REAC-TION TURBINE (PROPOSITION D'UNE ME-SURE POUR EVITER IA TORQUE DANS PASPIRATEUR D'UNE TURBINE A REAC-

TiON), Technische Universitaet, Munich (West Ger-many). Institut fuer Hydraulische Maschinen und Anlagen.

Aniagen. J. Raabe

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J. Kaabe. In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 35-39, 1972 (release date). 2 ref.

Descriptors: *Cavitation, *Fluid mechanics, *Impellers, *Vortices, *Francis turbines, Turbines, Penstocks, Erosion, Rotors, Hydraulic design. Identifiers: *Cavitation control.

To avoid pressure pulsations produced by a rotating helicoidal whirl, which may cavitate, in the draft tube of a Francis Turbine at partial load, it is proposed that the center of the hub or crown be made turnable relative to the crown or the hub. Moreover the secondary flow caused by the relative whirl in the channels of the runner may be diminished by meridional ribs. (Knapp-USGS) W73-07510 W73-07510

DECREASE IN CAVITATION EROSION INTENSITY FOR HIGH-HEAD GATES BY USING THE

SITY FOR HIGH-HEAD GATES BY USING THE SUPERCAVITATING STRUCTURES, Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenia i Inzhenernoi Gidrogeologii, Moscow (USSR).
P. E. Lisenko, V. D. Bedev, and G. A. Chepajkin. In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 41-44, 1972 (release date). 8 fig.

Descriptors: *Cavitation, *Gates, *Erosion, *Flow separation, *Hydraulic design, Erosion control. control.

Identifiers: *Supercavitating gates.

Laboratory and full-scale investigations as well as calculations show that when gates are exposed by heads greater than 15 m cavitation occurs beyond the gate; this cavitation is accompanied by erosion of conduit walls and floor as well as by sealing devices. Two methods of erosion prevention are creation of unstalled flows and active influence on the flow heads of the contract o the flow by means of creating separated patterns of cavitation ('supercavitation'). Supercavitation is gate chambers can be achieved by simple design measures. (Knapp-USGS)

HYDRAULIC STRUCTURES OPERATION UNDER CAVITATION CONDITIONS, All-Union Designing Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR). R. Galperin, V. Semenkov, G. Tsedrov, L. Goncharov, and R. Razakov.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 45-48, 1972 (release date). 9 fig, 1 tab, 3 ref.

Descriptors: *Spillways, *Cavitation, *Erosion control, *Flow separation, *Air entrainment, Rydraulic design, Aeration, Boundary layers. Identifiers: Cavitation control.

Identifiers: Cavitation control.

Spillway structures of high-speed projects operate under conditions contributing to inception of cavitation and cavitation erosion. Absolute prohibition of operation conditions involving cavitation cannot be justified either by engineering or by economic factors. Data characterizing the development of cavitation erosion with time were obtained during observation of the pier baffles of an existing project. Pyramidal pier baffles installed in staggered order at the stilling basin of the multibay spillway dam were subjected to cavitation regime for the period from 6 to 23 days. At 600 hours the experimental curve relating erosion depth versus the operation duration asymptotically becomes flat. The volume of possible cavitation erosion may be predicted for similar cases. Acration of the wall boundary layer is a promising method of protection against cavitation. Theoretical and experimental studies and observations of prototype structure behavior has proved the efficiency of the studies and observations of prototype structure behavior has proved the efficiency of the studies and observations. prototype structure behavior has proved the effi-ciency of artificial air saturation of the wall boun-dary layer of the high-head flow. (Knapp-USGS) W73-07512

STUDY OF CAVITATION ON BLADES OF A HIGH-HEAD ADJUSTABLE-BLADE WATER

TURBINE, Tsentralnyi Nauchno-Issledovatelskii Kotlotur-binnyi Institut, Leningrad (USSR). Yu. U. Edel, Yu. A. Grivnin, N. N. Kovalev, and

Yu. O. Eden, Tu. A. Carlonan,
B. A. Sharapov.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research,
Paris, August 29-September 3, 1971, Volume 5, p
53-56, 1972 (release date). 2 fig, 3 ref.

Descriptors: *Cavitation, *Turbines, *Hydraulic models, Laboratory tests, Fluid mechanics, Ero-sion, Impellers. Identifiers: *Kaplan turbines.

A series of cavitation studies on blades of a A series of cavitation studies on blades of a Kaplan turbine included tests on turbine models and on a cavitation test pipe. The purpose was to work out theoretical and experimental methods of obtaining blade profiles of high cavitational characteristics. Cavitation patterns on turbine blades generally correspond to the patterns observed on sets of flat profiles under the same conditions. (Knapp-USGS)
W73-07513 W73-07513

CAVITATION TESTS ON BAFFLE PIERS AND BUCKET SPLITTERS OF SPILLWAY HYDRAULIC STRUCTURES,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
N. P. Rozanov, R. M. Razakov, and A. T.

Ravesminkov.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, 1972 (release date). 5 fig, 3 ref.

Descriptors: *Cavitation, *Spillways, *Hydraulic structures, *Erosion control, *Hydraulic models, Flow separation, Air entrainment, Hydraulic design, Aeration, Boundary layers, Hydraulics, Fluid mechanics.

Cases of baffle piers and bucket splitter failures due to cavitation have repeatedly taken place.

Many of these destructions have occurred at relatively low flow velocities such as 16-18 m per second. Basic experimental research was carried out in a vacuum tank representing a 'closed' type steel flume with windows in its working section 0.6 m wide, 2 m high in its top part, and 0.75 m high in its lower part. Discharge reached 500 liters per second; the maximum velocities of water in the flume were 3-8 meters per second; and the maximum vacuum above the free surface of the flow was 9.9 m of water. Various baffle piers mounted in an apron and operating in a hydraulic jump as well as bucket splitters were examined. Some baffle piers and flow splitters were examined in a high-speed cavitation tunnel having the test section of 90 x 35 sq mm at velocities of 21-25 m per second. The method of injecting air into the zones of maximum vacuum on the sides of baffle piers turned out to be the most effective protection. In this case the collapse of cavitation bubbles is cushioned and the regime of streamlining the baffle pier is improved. (Knapp-USGS)

INVESTIGATION OF RELATIVE CAVITATION RESISTANCE OF MATERIALS AND PROTECTIVE COATINGS AND DEVELOPMENT OF MEASURES AGAINST CAVITATION EROSION OF HYDRAULIC STRUCTURE ELEMENTS, Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki, Leningrad (USSR).

I. V. Plokhotnikov.

II. Hydraulic greagers and its institut of the control of the

I. Y. PIOKNOUNKOV.

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 69-72, 1972 (release date). 1 fig, 1 tab.

Descriptors: "Cavitation, "Spillways, "Hydraulic structures, "Erosion control, "Hydraulic models, Flow separation, Air entrainment, Hydraulic design, Aeration, Boundary layers, Hydraulics, Fluid mechanics.

Systematic studies associated with the problem of protecting turbine waterways and hydraulic structure elements against cavitation erosion are reviewed. They include: (1) development of relatively cavitation-resistant materials and coatings for protection of surfaces exposed to water flow against cavitation erosion; (2) investigation of the operating conditions of hydroturbine units with reference to the development of optimum operating regimes characterized by a minimum rate of cavitation erosion. The most dangerous is the separation type of cavitation when the flow separates from individual surface areas (at flow boundaries, past roughness elements, etc.). In this separates from individual surface areas (at now boundaries, past roughness elements, etc.). In this case a quasi-static vapor-gas cavity forms, with bubbles imploding in the end zone of this cavity, which results in damage to the material. Studies on erosion of materials at a constant flow velocity and at different stages of the above cavitation process demonstrate that as cavitation develops, process demonstrate that as cavitation develops, the rate of crosion first grows and then decreases. Relative cavitation resistance of materials and coatings was studied on two set-ups with Venturi tubes under most severe cavitation regimes. The most promising cavitation-resistant coatings for concrete surfaces are epoxy materials. On metal surfaces epoxy coatings proved less effective whereas materials with a high degree of absorption of elastic deformation energy, such as rubber and rubber-like materials which adhere fairly well to metals, revealed the greatest cavitation resistance. However, these rubber-like materials cannot yet be recommended for protection of concrete surfaces because of poor adhesion to concrete. (K-napp-USGS) napp-USGS) W73-07515

CAVITATION IN STILLING BASIN APPUR-TENANCES, Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
M. H. Abdul Khader, and H. Suresh Rao.

Field 08-ENGINEERING WORKS

Group 8B—Hydraulics

In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 73-76, 1972 (release date). 8 ref.

*Hydraulic models, *Hydraulic Hydraulic structures, *Hydraulic Descriptors: imilitude, "Hydraulic structures, "Hydraulic jump, "Cavitation, Model studies, Laboratory tests, Fluid mechanics, Hydraulics.

It is common practice to use baffle piers or baffle plates to stabilize the hydraulic jump in stilling basins. Fluctuating pressure may cause cavitation on these devices. Considerable research work has been carried out using open air models to develop structures with low cavitation tendency. Failure structures with now calviation tendency. Fadante due to cavitation has affected hydraulic structures although the open air model studies of the same structure did not indicate the occurrence of cavitation. This indicates the need for further studies on scaling relationship. A few case studies are given to emphasize this fact. (Knapp-USGS) 73-07516

CAVITATION DAMAGE DOWNSTREAM

FROM OUTLET WORKS GATES, Bureau of Reclamation, Denver, Colo. Engineer-

Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. E. Wagner, and M. A. Jabara.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 93-96, 1972 (release date). 3 fig, 1 ref.

Descriptors: "Cavitation, "Spillways, "Hydraulic structures, "Erosion control, "Hydraulic models, Flow separation, Air entrainment, Hydraulic design, Aeration, Boundary layers, Hydraulics, Fluid mechanics.

Serious damage to concrete flow surfaces on several projects, caused by fluid flow cavitation, immediately downstream from high-pressure regulating slide gates was studied. In each instance the damage was readily traceable to misalignment or install ground of the contract of the contra damage was readily traceable to misalignment or irregularity in the flow surface. A small amount of air supplied to the sides and bottom of a jet will air supplied to the sides and bottom of a jet will prevent cavitation damage downstream from regulating gates. Model studies were conducted to develop a method of aerating the jet. These studies resulted in the development of a 12-inch-square aeration groove in the sidewalls of the existing conduit immediately downstream from the gate frame. To cause the flow to clear the grooves, a 1-inch-staffers will be abound in anoth sidewall sides. Traine. To cause the riow to clear the groves, a trainch deflector will be placed in each sidewall immediately upstream from the groove. Several gate configurations were tested to develop general guidelines for aerating the flow from outlet gates. guidelines for aerating the flow from outlet gates. Rather than using aeration grooves which were used on existing structures and which must be carefully designed to prevent them from filling with water, the Bureau of Reclamation plans to provide outward offsets on the sidewalls and invert of future structures. In general, an offset on the invert equal to one-sixth the width of the gate and offsets on the sidewalls equal to one-twelfth vert of lutile silver in the width of the gate and offsets on the sidewalls equal to one-twelfth of the gate width are adequate to aerate the jet and minimize fins of water in the downstream flow passage. (Knapp-USGS)

CAVITATION DAMAGE AT KINZUA DAM, AL-LEGHENY RESERVOIR, Army Engineer District, Pittsburgh, Pa. R. W. Schmitt.

In: Hydraulic research and its impact on the enin: Hydraunc research and its impact on the en-vironment; Proceedings of 14th Congress of Inter-national Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 97-101, 1972 (release date). 9 fig., 2 ref.

Descriptors: *Cavitation, *Spillways, *Hydraulic structures, *Erosion control, *Hydraulic models, Flow separation, Air entrainment, Hydraulic

design, Aeration, Boundary layers, Hydraulics, Fluid mechanics, *Pennsylvania. Identifiers: *Kinzua Dam (Pa).

Damage to the intakes of the six low-level conduits at Kinzua Dam was discovered during its premier season of high-head operation. The destructive cavitation experienced in the intakes of the low-level conduits at Kinzua Dam was an erosive-pitting process created by the successive formation and collapse of vapor pockets in low pressure areas associated with high-velocity flows. Damage was caused by open bulkhead slots. Flows down this slot intersected those entering the conduit and the result was a zone of low pressure caused by 2 high-velocity jets creating severe turbulence along the roof immediately downstream from the open bulkhead slot. The top of the bulkhead slot was closed with temporary filler to determine if this would arrest the cavitation. All vibration and noise ceased. (Kanap-USGS) W73-07518

CAVITATION CONTROL IN AN ENERGY DIS-SIPATION STRUCTURE, Birmingham Univ. (England). Dept. of Civil En-

1. E. I. HOMBA:
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 115-119, 1972 (release date). 2 fig, 2 ref.

Descriptors: *Cavitation, *Spillways, *Hydraulic structures, *Erosion control, *Hydraulic models, Flow separation, Air entrainment, Hydraulic design, Acration, Boundary layers, Hydraulics, Fluid mechanics.

dentifiers: *Clywedog Dam (Wales).

For the Clywedog dam, Wales, an extensive program of model testing was carried out to determine the hydraulic characteristics of its submerged energy dissipators. During the commissioning period of the dam, the two chambers were tested over a cumulative period of 750 hours during which observations were made of wave action in the stilling pool and of the head-discharge charactristics of the release system. Prototype performance was found to agree closely with the model predictions but over this period of testing, carried out without chamber ventilation, intermittent pitting of the roof concrete of one chamber occurred to a depth of 2 inches over a circular area of 3 ft radius and centered on a point 10 ft downstream of the nozzle. Test results show the effectiveness of ventilation in raising the mean effectiveness of ventilation in raising the mean pressure at the chamber boundaries and in reduc-ing the values of the transients. The transient peaks were effectively trimmed, removing a dangerous operating condition. The slight wave action produced in the stilling pool by chamber ventilation was perfectly acceptable. (Knapp-USGS) W73-07519

THE INCEPTION OF CAVITATION IN A CEN-TRIFUGAL PUMP DETECTED BY THE ANAL-YSIS OF THE PRESSURE PULSATIONS

YSIS OF THE PRESSURE PULSATIONS GENERATED BY THE MACHINE, Genoa Univ. (Italy). Inst. of Hydraulics. G. Federici, E. Raiteri, and F. Siccardi. In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 127-130, 1972 (release date). 5 fig, 6 ref.

Descriptors: *Cavitation, *Pumps, *Impellers, *Pressure, Laboratory tests, Centrifugal pumps, Hydraulics, Monitoring, Pump testing.

The changes that cavitation produces in the pres-sure pulsations generated by the rotating blades in a pump can be used to detect the beginning of

cavitation. This method has a sensitivity better than the classical methods. Cavitation normally begins at the inlet edge of a single vane, or in a limited suction area on all the vanes. Cavitation arising on a single blade affects the discharge dis-tribution in the runner and increases differences at tribution in the runner and increases differences at the impeller vanes exit; the amplitude of the pulsations increases. Cavitation also affects fluid density at the blade inlet edge; near the cavitation point a two-phase fluid with smaller density reduces the sound propagation velocity. When cavitation extends to all blades all relative velocity distributions are modified. (Knapp-USGS)

THE DAM-BREAK PROBLEM.

Tennessee Univ., Knoxville. R. L. A. de Jong.

R. L. A. de Jong.
In: Hydraulic research and its impact on the environment; Proceedings of 14th Congress of International Association for Hydraulic Research, Paris, August 29-September 3, 1971, Volume 5, p 169-171, 1972 (release date).

Descriptors: *Floods, *Flood waves, *Dam failure, Stage-discharge relations, Peak discharge, Flood peak, Flood forecasting.

Flood waves river valleys can be classified according to their mode of generation in the following two categories: (1) natural floods caused by externe climatological and physiographic conditions, (2) manmade floods caused by the acidental or planned removal of a retaining structure. Mande floods are usually isolated events. Natural floods may be caused by regional heavy rainfall resulting in several amaller floods in adjacent watersheds, leading in turn to accumulation of flood peaks at a site of confluent streams, thereby emphasizing the damage potential of natural flood phasizing the damage potential of natural flood ditions. Artificial floods have always been asconsiders. Arthrella Hoods nave always been associated with events of extreme magnitude, since they usually start as the almost instantaneous release of a large volume of water. This means that the initial hydrography just below the site of the failing dam has a higher peak than almost all natural floods of record. (Knapp-USGS)

COMPUTATION OF EXTREME FLOODS IN A

LARGE RESERVOIR, Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 02E.
W73-07526

THE DETERMINATION OF ICE FORCES ON SMALL STRUCTURES, Acres (H. G.) and Co. Ltd., Niagara Falls (On-tario). Hydraulic Dept. For primary bibliographic entry see Field 02C. W73-07662

AXISYMMETRIC SHALLOW SUBMERGED

AXISYMMETRIC SHALLOW SUBMERGED TURBULENT JETS, Illinois Univ., Urbana. Dept. of Civil Engineering. W. H. C. Maxwell, and H. Pazwash. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No NY4, Paper 9675, p 637-652, April 1973. 10 fig, 13 ref, append.

Descriptors: *Mixing, *Jets, *Turbulent flow, Turbulence, Hydraulics, Mathematical models.
Identifiers: Submerged flow.

The modification of a jet flow pattern by a nearby free surface may be described by an approximate mathematical model employing an image jet and utilizing approximations to the P-function. The mathematical model compares well with two independent data sets, one for a horizontal jet and one for a jet with small inclination to the horizontal. In both cases the maximum velocity migrates upward toward the free surface downstream from the noz-zle. The flow pattern is strongly affected by very small inclinations of the nozzle from the horizon-tal. Some of the observed and predicted effects might readily be erroneously attributed to density differences between the effluent and the reservoir.

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REGULATION OF LONGSHORE SEDIMENT TRANSPORT (REGULIROVANIYE VDOL'-BEREGOVOGO POTOKA NANOSOV), Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics. For primary bibliographic entry see Field 02L W73-07681

SOME RESULTS OF FULL-SCALE STUDIES OF CHANNEL FLOW TURBULENCE, D. I. Grinval'd. Fluid Mechanics—Soviet Research, Vol 1, No 6, p 115-120, November-December 1972. 4 fig, 5 ref.

Descriptors: "Fluid mechanics, "Flow, "Channel flow, "Turbulence, "Flow characteristics, Flow rates, Velocity, Energy dissipation, Mathematical studies, Analytical techniques, Equations, Instrumentation. Identifiers: *USSR, Gaussian distribution.

Statistical characteristics of the turbulence of channel flows were investigated in full-scale studies carried out on the Turunchuk and Dnestr Rivers by the Department of Hydrology of the Odessa Hydrometeorological Institute. Except for near-bottom flow, distribution of flow velocity is governed by the normal Gaussian law. The intensity of turbulence increases from the surface toward the base of flow, while the scale of turbulence increases from the bottom to mid-depths. Temporal structural functions plotted from experimental data obey the Kolmogorov-Obukhov '2/3-law' for the middle layer of flow. The inertial integral is developed in a fixed band of frequencies, for the middle layer of flow. The inertial integral is developed in a fixed band of frequencies, for which the '2/3-law' was used for the structural function and the '5/3-law' for the spectral function. Values of the rate of energy dissipation computed directly from the spectrum and by using the structural function were in relatively good agreement. (Josefson-USGS) W73-07685

TURBULENT TRANSFER IN ROTARY FLOWS OF AN INCOMPRESSIBLE FLUID, B. P. Ustimenko, V. N. Zmeykov, and M. A.

Fluid Mechanics-Soviet Research, Vol 1, No 6, p 121-127, November-December 1972. 5 fig, 9 ref.

Descriptors: *Fluid mechanics, *Hydrodynamics, *Flow, *Rotational flow, *Turbulence, Velocity, Reynolds number, Heat transfer, Temperature, Pressure, Shear stress, Ducts, Jets, Fluctuations. Identifiers: *USSR, Turbulent exchange, Heat

The processes of turbulent transfer in stable (rotating outer cylinder) and unstable (rotating inner cylinder) flows were investigated in hydrodynamic and heat-exchange studies of rotational flows of incompressible, viscous fluids conducted recently at the Kazakh Institute of Power Engineering. The difference in the action of centrifugal forces on turbulent exchange in circular flows also appears in more complex flows in plane curved ducts and cyclone chambers. (Josefson-USGS)

OBSERVATION OF TURBULENCE IN THE BOTTOM LAYER OF THE SEA, V. G. Labeish, and Kh. V. Burnashev. Fluid Mechanics—Soviet Research, Vol 1, No 6, p 152-154, November-December 1972. 3 fig, 2 ref.

Descriptors: *Turbulence, *Sea water, *Dyes, *Dye dispersion, *Boundary layers, Turbulent boundary layers, Flow, Velocity, Photography, Identifiers: *USSR, *Black Sea, *Dye-tracer stu

The microstructure of the boundary layer was investigated in dye-tracer studies in the eastern part of the Black Sea at a distance of about one mile from shore. As a datum point and measure of length, a circular rod 5 mm in diameter was placed at the sea bottom downstream from the point of dye injection. A total of 11 high-quality pictures were taken at the 20-cm level for determination of mean bottom-flow velocity, diffusion of the dye column, vortex structure of the bottom layer, and separation of the dye from the laminar sublayer. A motion characteristic of flow over hydraulically smooth surfaces was observed in all tests in the bottom layer. Roughness protuberances (sand grains) did not extend beyond the limit of the laminar sublayer, which was about 0.5-cm thick. The vertical distribution of velocity, beginning at about the 5-cm level, obeyed a logarithmic law. (Josefson-USGS)

EXPERIMENTAL INVESTIGATION OF TURBULENT DIFFUSION IN THE SEA BY THE FLUORESCENT TRACER METHOD, R. V. Ozmidov, A. N. Gezentsvei, and G. S.

Karabashev. Fluid Mechanics.-Soviet Research, Vol 1, No 6, p 155-159, November-December 1972. 5 fig, 4 ref.

Descriptors: *Turbulence, *Diffusion, *Sea water, *Fluorescent dye, *Tracking techniques, Tracers, Dye releases, Dye concentrations, Dye dispersion. Identifiers: *USSR, *Black Sea, *Dye-tracer stu-dies, *Turbulent diffusion, Turbulent exchange.

Turbulence and turbulent exchange were investigated in dye-tracer studies conducted in the Black Sea in 1964-66 with a small research vessel of the Institute of Oceanology, USSR Academy of Sciences. To measure dye concentrations in water with the ship underway, a device provided with a sensor and equipped for towing at various depths was used. Time-of-travel data and tracking techniques for continuous sampling and recording are presented graphically. Test results are interpreted in terms of solving a semiempirical diffusion equation, and diffusion coefficients and their dependence on the scale of the phenomenon are established. (Josefson-USGS) W73-07688

ELECTRICAL INSTRUMENT FOR DETERMIN-ING WATER-FLOW CONDITIONS, N. A. Gnitetskii, L. F. Kozlov, and V. M. Shakalo. Fluid Mechanics—Soviet Research, Vol 1, No 6, p 172-173, November-December 1972. 1 fig.

Descriptors: *Instrumentation, *Anemometers, *Thermometers, *Flow measurement, Transition flow, Boundary layers. Identifiers: *USSR, Oscillograms.

A dc hot-wire thermoanemometer was developed and tested at the Institute of Hydromechanics, Ukrainian Academy of Sciences. The ther-moanemometer can be used to determine the beginning of transition flow in the boundary layer. For detailed flow studies, a constant-temperature filament with a broad frequency range should be used with the instrument. (Josefson-USGS)

PLANS FOR REDUCTION OF SHOALING IN BRUNSWICK HARBOR AND JEKYLL CREEK, GEORGIA; HYDRAULIC MODEL INVESTIGA-

Army Engineer Waterways Experiment Station, Vicksburg, Miss. F. A. Herrmann, Jr., and I. C. Tallant.

Sponsored by U.S. Army Engineer District, Savannah, Georgia. Technical Report H-72-5, Sep-tember, 1972. 50 p, 9 tab, 15 photo, 94 pl, 2 ap-

Descriptors: *Shoals, *Hydraulic models, *Georgia, Tides.
Identifiers: *Brunswick Harbor (Ga), *Jekyll

Fixed-bed model of Brunswick Harbor reproduced approximately 67 square miles of prototype area beginning in St. Simons Sound and extending to the upper portions of the Brunswick and Turtle Rivers and including all of East River and Academy Creek, the extensive system of saltwater creeks and marshes that effect tidal action in the area, and the Intracoastal Waterway from Brunswick River through Jekyll Creek to the U.S. Highway 84 Bridge. The model was equipped with the necessary appurtenances for the accurate reproduction of tides, tidal currents, shoaling patterns, and other significant prototype phenomena. the necessary appurenances for the accurate reproduction of tides, tidal currents, shoaling patterns, and other significant prototype phenomena. The primary purpose of the model study was to test the effectiveness of proposed plans for the reduction of shoaling in Brunswick Harbor. Tests of plans to reduce shoaling in Jekyll Creek were later added. Model verification tests indicated that the hydraulic and shoaling regimens were in satisfactory agreement with those of the prototype for comparable conditions. It therefore can be assumed that the model provided quantitative answers concerning the effects of the proposed improvement plans on the hydraulic regimen of the prototype area reproduced in the model and reliable qualitative answers as to the effects of proposed improvements on shoaling rates and patterns in navigation channels. (WES) W73-07728

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 3, WESTPORT SMALL-BOAT BASIN STUDY; HYDRAULIC MODEL INVESTIGA-

Army Engir er Waterways Experiment Station,

Army Engineer waterways Experiment Station, Vicksburg, Miss.

N. J. Brogdon, Jr.
Sponsored by U.S. Army Engineer District, Seat-tle. Report H-72-2, Report 3, September, 1972. 13 p, 1 tab, 22 photo, 116 plates.

Descriptors: *Estuaries, *Harbors, *Hydraulic models, *Washington, Currents (Water), Disper-

Identifiers: *Grays Harbor (Wash), *Small boat basins, *Westport (Wash), Flushing rates.

Comprehensive fixed-bed model of Grays Harbor estuary was used to determine current velocities, surface current patterns, flushing and dispersion characteristics, and qualitative shoating rates and patterns for four small-boat basin plans near West-port, Wash. Data collection consisted of current port, Wash. Data collection consisted of current velocities, surface current pattern photographs, qualitative shoating rates and patterns, flushing rates, and dispersion from a proposed sewage outfall for the City of Westport. Model test results indicate that only insignificant local changes in current velocities and surface current patterns outside proposed basins would result from construction of any of four small-boat basin plans. Shoating rate for any of the plans would probably be moderate. Flushing rate for plan 1 or 1 A would be better than for plan 2 or 2A. Flushing rates for plans 2 and 2A could be improved by addition of channel connecting the western end of the basin to either existing Westhaven Cove or South Bay. Waste material discharged from proposed Westport sewage outdischarged from proposed Westport sewage out-fall would enter proposed basin during both ebb and flood currents, but maximum concentration in basin would only be on the order of 0.01 percent of initial concentration at outfall. (WES)

Field 08-ENGINEERING WORKS

Group 8B-Hydraulics

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 2, NORTH JETTY STUDY; HYDRAU-LIC MODEL INVESTIGATION,

Army Engineer Vicksburg, Miss. N. J. Brogdon, Jr Waterways Experiment Station,

Sponsored by U.S. Army Engineer District, Seat-tle. Technical Report H-72-2, Report 2, September 1972. 16 p, 4 tab, 5 photo, 122 plates.

Descriptors: *Estuaries, *Hydraulic models, *Jetties, *Washington, Salinity, Shoals, Dye disper-Identifiers: *Gravs Harbor (Wash).

Comprehensive fixed-bed model of the Grays Harbor estuary was used to determine the effects of several plans for rehabilitation of the north jetty. Model tests were conducted to determine the effects on hydraulic, salinity, shoaling, and dye dispersion characteristics. Test results consist of current velocity, tidal height, and salinity measurements; shoaling patterns in the entrance area; dye dispersion characteristics; and photographs of surface current patterns. Model test results indicated that a 650-ft extension to the north jetty (plan 2) would cause only insignificant local changes in current velocities and patterns in the entrance area. A 1500-ft extension to the north jetty (plan 1) would not cause significant changes Comprehensive fixed-bed model of the Grays Harentraince area. A Joseph extension to the norm jetty (plan 1) would not cause significant changes in tidal elevations, current velocities, current pat-terns, or extent of saltwater intrusion; but vertical mixing would be somewhat increased in the main channel of entrance area and somewhat decreased in northern half of entrance area. Shoaling would an normern half of entrance area. Shoaling would increase in the existing, naturally deep entrance navigation channel. Flushing of pollutants from upstream source would be decreased, while that for an entrance area source would be increased. It does not appear that the stability of Point Chehalis would be significantly affected. (WES) W73-07731

GRAYS HARBOR ESTUARY, WASHINGTON; REPORT 4, SOUTH JETTY STUDY; HYDRAU-LIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

N.J. Brogdon, Jr. Sponsored by U.S. Army Engineer District, Seat-tle. Technical Report H-72-2, Report 4, September 1972. 21 p, 4 tab, 16 photo, 260 plates.

Descriptors: *Estuaries, *Hydraulic models, *Jetties, *Washington, Currents (Water), Shoals, Salinity, Dispersion. Identifiers: *Grays Harbor (Wash).

The outer 6000 ft of the south jetty is degraded to The outer 6000 ft of the south jetty is degraded to or below the elevation of mean lower low water. About 4000 ft was rehabilitated to el +15 mean lower low water in 1966. The existing comprehensive fixed-bed model of the Grays Harbor estuary was used to determine the effects within the limitations of the model of five plans for further rehabilitation of the deteriorated portion of the south jetty and two plans for reducing the length of the existing rehabilitated portion. Model tests were conducted to determine hydraulic. salinity. were conducted to determine hydraulic, salinity, shoaling, and dispersion characteristics, and surface flow directions for the longest rehabilitation and reduction (plans 1 and 7, respectively). Model test results consist of tidal height, current velocity, test results consist of tidal height, current velocity, and salinity measurements; photographs of surface current directions; shoaling patterns and rates in the entrance area; and dye dispersion characteristics. Model test results are given. (WES) W73-07732

NAVIGATION CONDITIONS AND FILLING AND EMPTYING SYSTEM, NEW BANKHEAD LOCK, BLACK WARRIOR RIVER, ALABAMA; HYDRAULIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

N. R. Oswalt, J. H. Ables, Jr., and T. E. Murphy.

Sponsored by U.S. Army Engineer District, Mobile. Technical Report H-72-6, September 1972. 29 p, 9 tab, 12 photo, 17 plates, append.

ors: *Locks, *Hydraulic models, Flow control, *Alabama. Identifiers: *Bankhead Lock Black Warrior River,

Investigations were concerned with planning and design of a new single-lift, 110- by 670-ft lock at the existing Bankhead Lock and Dam on the Black Warrior River in Alabama. Presently, tows negotiate the 69-ft lift at the Bankhead project through a double-lift lock with chamber dimensions of only 52 by 285 ft. Multiple lockages are required for all but the very small tows. Tests were conducted on two models. Two basic plans (sites) for the new lock were considered and preliminary tests demonstrated that acceptable navigation conditions could be provided with the lock at either site. Model tests were directed toward detailed ditions could be provided with the lock at either site. Model tests were directed toward detailed study of plan I and resulted in development of plan IB. Navigation conditions were excellent in the downstream approach but were complicated in the upstream approach but sure complicated in the upstream approach by surges in this canal created by filling the lock. An extensive study of these surges was made with a computer program (Appendix A). Flow conditions in the lock chamber during a filling operation were excellent with a very small degree of surface turbulence. The system developed is particularly desirable for high-lift locks in that it is insensitive to misoperation. (WES)

EFFECTS OF PROPOSED EXTENSION OF CRANEY ISLAND DISPOSAL AREA ON TIDES, CURRENTS, AND SALINITIES; HYDRAULIC MODEL INVESTIGATION,

Army Engin neer Waterways Experiment Station, Vicksburg, Miss. R. A. Boland, Jr.

R. A. Boland, Jr. Sponsored by U.S. Army Engineer District, Nor-folk. Army Engineer Waterways Experiment Sta-tion, Vicksburg, Mississippi, Miscellaneous Paper H-72-8, June 1972. 8 p. 3 tab, 13 photo, 30 plates.

Descriptors: *Dikes, *Hydraulic models, Currents (Water), Tides, Salinity, *Virginia.
Identifiers: *Craney Island Dike, *Spoil disposal,

Fixed-bed model was used to determine the effects of the proposed westward extension of the present Craney Island dike on surface flow patterns, velocities adjacent to the levees, salinities in the adjacent flats, and tidal heights. The test results consist of comparable measurements of tide heights, current velocities, and salinities for existing and proposed conditions. An analysis of the results of the model tests led to the conclusions that the proposed westward extension of the present Craney Island disposal area using either of two dike alignments tested would have no significant effects on local current velocities, salinities, or tidal heights. Also, the spoil area expansion would have minimal and insignificant effects on other factors influencing the local environment, with the obvious exception that the portion of the river bottom within the limits of the proposed disposal area expansion would be removed. (WES) W73-07734 Fixed-bed model was used to determine the ef-

GEORGETOWN HARBOR NAVIGATION STU-

Corps of Engineers, Washington, D.C. Committee on Tidal Hydraulics. For primary bibliographic entry see Field 02J. W73-07735

WATER SUPPLY AT LOS ALAMOS DURING

Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 04B. W73-07758

8C. Hydraulic Machinery

DYNAMIC COMPUTER SIMULATION AND CONTROL METHODS FOR WATER DISTRIBUTION SYSTEMS, General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div. For primary bibliographic entry see Field 04A. W73-07165

A ROTATING THYRISTOR EXCITATION SYSTEM FOR HYDROELECTRIC GENERA-

TORS,
General Electric Co., Schenectady, N.Y.
E. C. Hartung, E. H. Lenfest, and G. R. Meloy.
Institution of Electrical and Electronics Engineers, Transactions, Power Apparatus Systems,
Vol PAS-91, No 5, p 2171-2178, Sept-Oct. 1972. 14 fig. 7 ref, disc

Descriptors: Electric generators, Hydroelectric power, Reliability, Voltage regulations, Rectifiers. Identifiers: *Excitation, *Rotating machines, *Thyristors, Prototype tests, Test results, Dynamic stability, Power system stability, Power leads, Oscillations, Amplification, Damping, Excitation regulators, John Day Powerplant (Ore), *Solid state devices, Magnetic amplifiers.

Use of solid state power components for rectification, amplification, and control can improve reliability and contribute to power system performance
through increased speed and more sophisticated
control. A contemporary approach to the high
response excitation system for hydroelectric
generators is described. This approach eliminates
the conventional mechanical commutator, the
main generator field collector rings, and many
field power connections and switching devices external to the generating unit. Excitation power
generation and commutation are accomplished by
using an alternating current exciter and thyristor
rectifier bridge directly connected to the generator
shaft. These elements, combined with a sophisticated static regulator depending only on electrically derived inputs, provide improved positive
damping of electric power system oscillations by
properly controlling excitation. This system was properly controlling excitation. This system was first applied to three 142,105-kva, 90-rpm hydroelectric generators in commercial operation. hydroele (USBR) 73-07558

THE DENVER SYSTEM OF WATER WORKS CONTROLS.

Denver Dept. of Water, Colo. C. E. C. Carlson.

Journal of the American Water Works Associa-tion, Vol. 63, p 513-516, August, 1971. 4 fig.

Descriptors: *Water works, *Control systems, *Remote control, Automatic control, Monitoring, Pumping, Flow control, Computers, *Colorado. Identifiers: *Denver (Colo.).

The three phase plan of the Denver Water Department to control and efficiently operate its water supply and water distribution systems is discussed. Since the late 1940's Denver has been using remote controls at a few selected points in its water systems. In the 1960's the city began to plan an automatic control system for its entire operation. The objectives of the control system are improved plant efficiency, conservation of water and power for pumping, and the avoidance of low pressures and inadequate supplies during peak periods. The control system would consist of remote control of pumping units and operating valves, information flows and recording, and auto-matic decision-making by computers. The first two matic decision-making by computers. Inc Irist two phases of the plan involve transmitting and record-ing data from the operation of the water systems. These phases are nearly complete and will lead into Phase III which involves the computer deci-sion-making and automatic control of the systems. (Elfers - North Carolina)

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8D. Soil Mechanics

A REGIONAL APPROACH TO THE LAND-SLIDE SEVERITY PROBLEM IN THE CON-TERMINOUS UNITED STATES, Purdue Univ., Lafayette, Ind. Water Resources Research Center Research Center. For primary bibliographic entry see Field 08E. W73-07168

PROPOSAL FOR 'QUALITY-CLASSES' IN SOIL SAMPLING AND THE IMPORTANCE ON BORING METHODS AND SAMPLING EQUIPMENT, ING METHODS AND SAMPLING EQUIPMENT, Ruhr River Association, Essen (West Germany). K. H. Idel, H. Muhs, and P. v Soos. In: Proceedings, 7th International Conference on Soil Mechanics and Foundations Engineering,

Mexico City, P. 11, 1969.

Descriptors: "Sampling, "Soil investigations, *Subsurface investigations, Classification, Soil properties, Drilling equipment, Rotary drilling, Boring, Soil mechanics, Soils, Undisturbed soils, Identifiers: "Quality levels, Disturbed soils, Soil samplers, Undisturbed samples, Drilling piston samplers, Drive samplers, Disturbed samples, Samples, Auger borings, Undisturbed soils.

Since the same quality of soil samples is not required for all investigations, 5 quality classes, based on accurate determinations of different soil properties, are proposed. When the condition of a sample has been changed by the sampling process so that even the grain size distribution cannot be correctly obtained, the sample quality corresponds to the lowest quality classes parent determinations. to the lowest quality class (class 5). Samples of the other 4 improved quality classes permit determining the particle size distribution (class 4), the moisture content (class 3), the void ratio or density (class 1). Using 5 quality classes would improve communication by avoiding the need for the infrequently justified term, undisturbed sample. Tables provided aid in determining the proper drilling procedures and sampling equipment needed to obbes provided aid in determining the proper drilling procedures and sampling equipment needed to obtain samples of a desired quality class. Factors such as soil type, water level depth, and method of loosening the soil are considered for both openand piston-type samplers. A minimum sample diameter of 3 in. is recommended. (USBR)

THE INFLUENCE OF THE LOAD INCLINA-TION ON THE BEARING CAPACITY OF SHAL-

Technische Universitaet, Berlin (West Germany). H. Muhs, and K. Weiss.

In: Proceedings 7th International Conference on Soil Mechanics and Foundations Engineering, Mexico City, Vol 2, p 187, 1969.

Descriptors: "Bearing capacity, "Foundations, "Foundation bearing tests, Loads (Forces), "Foundation failure, Prototype tests, Theoretical analysis, Foundation investigations. Identifiers: "Bearing capacity, "Footings, Loading tests, Eccentric loading, Stressdistribution, Normal stress, Tangential stress, Inclined loads.

Four full-size tests were performed on shallow concrete footings embedded in a sand-gravel mixture compacted to a relative density of 78%. Each footing was 0.5 by 2.0 m in plan, 0.8 m high, and embedded 0.5 m from the bottom of the footing. Test loadings were: (1) vertical and centric, (2) vertical and eccentric, (3) inclined and centric, and (4) inclined and eccentric. The angle of load inclination was 20 deg to the vertical and parallel to the longer side of the footing. The eccentricity used was one-sixth of the footing length in the longer direction. Tests indicate that the bearing constitute the inclinate least of 20 des in 62% the capacity of the inclined load of 20 deg is 62%, the

vertical eccentric test, 68%, and the inclined eccentric test, 42% of the corresponding capacity performed with vertical centric loading. Since load inclination exerts an important influence on footing bearing capacity, the practice of computing footing safety by only considering the vertical component of the load is incorrect. A factor of I minus the tangent of the inclination angle is suggested for reducing the bearing capacity under inclined centric loads. (USBR)

8E. Rock Mechanics and Geology

A REGIONAL APPROACH TO THE LAND-SLIDE SEVERITY PROBLEM IN THE CON-TERMINOUS UNITED STATES, Purdue Univ., Lafayette, Ind. Water Resources

Research Center.

M. Nakamura.

M. Sc Thesis. 1972. 181 p, 41 fig, 33 tab, 39 ref, 2 append. OWRR-A-009-IND (7).

Descriptors: *Landslides, *Highways, *Slope sta-bility, Rock mechanics, Soils, Land classification.

The principal objective was an examination of the detailed physiographic highway engineering system proposed by Witczak in 1970 which made a national rating of regional landslide susceptibility and to determine its suitability as to a filing and prediction system for regionalizing landslide severity. An index of severity of landslide occurrence (I.S.) is proposed which gives the projected number of landslides which should have occurred along 1,000 miles of highways (railroads) of a region within 'n' years. The system tends to normalize the data with respect to the intensity of region within 'n' years. The system tends to normalize the data with respect to the intensity of regional engineering activity. The smaller and more homogeneous Witczak units permitted more reliable predictions of regional landslide susceptibility than has been previously possible on a national scale. All units are classified as to major, medium, or minor severity of landslide occurrence, according to the kind and age of bedrock, the thickness and character of surface soils, the extent and stage of dissection, and other specific conditions in the region. Such predictions should be useful to engineers working over large geographic areas.

PETROCHEMISTRY OF A PRECAMBRIAN IGNEOUS PROVINCE, ST. FRANCOIS MOUNTAINS, MISSOURI, Missouri Geological Survey and Water Resources,

For primary bibliographic entry see Field 02K. W73-07347

PRESSURE BEHAVIOR IN SUBSURFACE DISPOSAL OF LIQUID INDUSTRIAL WASTES, Mississippi State Univ., State College. For primary bibliographic entry see Field 05E. W73-07451

A COMPUTER MODEL FOR SIMULATING PROGRESSIVE, LARGE-SCALE MOVEMENTS IN BLOCKY ROCK SYSTEMS, Instituto Geologico y Minero de Espana, Madrid. P. A. Cue-d-ali

P. A. Cundall.

P. A. Cundall.

Paper II-8, Rock Fractures, Proceedings of the International Symposium on Rock Mechanics, Nancy, France, Oct 1971. 12 p, 6 fig, 4 ref, append.

Descriptors: Engineering geology, Computer models, Rock mechanics, Failure (Mechanics), Joints (Geology), Rock bolts, Fractures (Geology), Stress analysis, Rock foundations, Stability, Movement, Deformation. Identifiers: "Stability analysis, "Rock slope stability, Damping, Progressive failures, Computer-aided design.

A simple computer program enables modeling of the progressive failure of a system of discrete rock blocks, provided that 2 assumptions can be made about the nature of jointed rock. These assumptions are that: (1) intact rock may be regarded as rigid, and (2) normal stiffness of a joint plays only a small part in the failure processes of the rock mass. An unlimited amount of displacement or rotation is allowed each block, and any block can touch any other block. The program permits individual study of the effects of joint geometry, joint parameters, loading conditions, and excavation procedures. Realistic friction laws may be used, including those in which the shear resistance decreases with shear displacement. Other laws, such as normal dilation of a joint and nonlinear failure envelopes, have also been successful. Since the program directly concerns forces and displacements, rock bolts may be incorporated easily. Water pressure could also be simulated by equivalent forces acting on the block faces. Up to 1000 blocks may be modeled with a computer of 60 k core store. (USBR)

ABSOLUTE STRESS MEASUREMENTS AT THE RANGELY ANTICLINE, NORTHWESTERN COLORADO, Geological Survey, Menlo Park, Calif. R. V. de la Cruz, and C. B. Raleigh. International Journal of Rock Mechanics and Mining Science, Vol 9, No 5, p 625-634, Sept 1972. 2 fig, 7 tab, 11 ref.

Descriptors: "Geologic investigations, "Strain gages, Stress analysis, Pressure, Rocks, Strain measurement, Rock pressures, Theoretical analysis, On-site investigations, Rock mechanics, Onsite data collections, On-site tests, Tensile stress, Identifiers: "Overcoring method," Borehole deformation gage, "Stress gages, Principal stress, Doorstoppers, Compressive stress, In situ cock, "In situ tests, Measuring instruments, Rock tests.

*In situ tests, Measuring instruments, Rock tests.

Five different methods for measuring in situ rock stress were evaluated: USBM 3-component borehole-deformation gage, direct strain gage, door stopper, USGS 9-component spherical gage, and photoelastic strain gage. Factors considered that affect each method were: (1) soundness of the theory, (2) practical difficulties and inaccuracies, (3) ease of field operation, and (4) accuracy and reproducibility of results. The overcoring method of the USBM borehole-deformation gage was found to be the most convenient and rapid means of obtaining reliable values of the magnitude and direction of stress. Suggested improvements for the USBM borehole-deformation gage include more adequate seals for the contact buttons, and more adequate support for the gage during overcoring. The doorstopper technique has the weakest basis theoretically and the USGS spherical gage technique uses theoretical assumptions that are quite different from field conditions. The direct strain gage, the photoelastic strain gage, and the doorstopper techniques surface strains must be measured with strain gages bonded into rock. (USBR)

THE ROLE OF THE ENGINEERING GEOLO-GIST IN THE INSTRUMENTATION PRO-GRAM, Corps of Engineers, Omaha, Nebr. L. B. Underwood. Bulletin of the Association of Engineering Geolo-gists, Vol 9, No 3, p 185-205, 207-212, Summer 1972. 10 fig, 10 ref, disc.

Descriptors: "Engineering geology, "Geologic investigations, Dam foundations, Instrumentation, Geology, Deformation, Faults (Geology), Foundations, Borcholes, Evaluation, Tunnel construction, Rock bolts, Stabilization, Joints (Geology),

Field 08-ENGINEERING WORKS

Group 8E-Rock Mechanics and Geology

Rock mechanics, Dam construction, Foundation investigations, Foundation rocks. Identifiers: *Rock competency, Rebound, Fort Randail Dam (South Dakota), Oahe Dam (South Dakota), NORAD.

Predicting rock strength and water problems dur-ing construction by examining core samples is rather difficult; therefore, instrumentation should be used to check rock performance during construction. Rock instrumentation programs frequently are not initiated until after serious conrrequently are not mitiated until after serious con-struction problems develop. Instances where earli-er instrumentation possibly could have prevented loss of time and money are given for Fort Randall Dam, Oahe Dam, and the underground Combat Center of NORAD. At Fort Randall Dam, horizontal movement of rock was discovered when the drive shaft of a water pump was sheared. Instru-mentation showed that sliding occurred on horizontal bentonite seams after vertical cuts were nonzontal benome scams after vertical cuts were excavated. At Oahe Dam, many problems arose because of difficulty in predicting the reaction of the weak Pierre shale foundation to excavations. At NORAD, stabilization of tunnel areas with time was observed. At an intersection of 2 tunnels, an instability problem might have been satisfactorily reinforced with rock bolts if there had been sufficient instrumentation of the intersection deformation. Instead, an additional reinforced concrete structure was built, costing several million dollars. W73-07555

8F. Concrete

INVESTIGATION OF POLYMER CONCRETE AND STEEL POLYMER CONCRETE, S. S. Davydov.

Bureau of Reclamation Translation 874, Sept 1972. 15 p, 5 fig, 2 tab, (Trans. of Beton i Zhelezobeton, No 3, p 1-5, May 1972).

Descriptors: *Construction materials, Polymers, Resins, Concrete technology, Lightweight aggregates, Strength, Durability, Deformation, *Structural members, Creep.
Identifiers: USSR, Chemical resistance, *Polymer concretes, Monomers, Corrosion resistance, *Composite structures.

Soviet institutes engaged in the investigation of polymer concrete for application as an improved construction material have developed a more economical polymer concrete composite with better structural and durability properties. The quantity of expensive monomers required was reduced by 33 to 50%; at the same time, strength of the polymer concrete was increased 30 to 40%. Several tests and investigations of polymer concrete discussed are: (1) resistance to chemical attack, (2) resistance to freezing and thawing, and (3) compressive and tensile creep deformation. Composite structural members of lightweight or standard polymer concrete and reinforced concrete were developed. Two methods for mak-ing composite structural members and the structural and physical properties of each are described. Applications of reinforced polymer concrete presented are: (1) mine tunnel ring supports, (2) overhead electric railroad powerline supports, (3) prestressed railroad ties, and (4) roof slabs for a synthetic fiber plant. (USBR) W73-07550

ROCK FOUNDATION CHARACTERISTICS AND DAM DESIGN, Roorke Univ. (India).

R. S. Varshney. International Journal of Rock Mechanics and Mining Science, Vol 9, No 5, p 645-659, Sept 1972. 10 fig. 1 tab. 15 ref. Descriptors: *Dam design, *Concrete dams, *Foundation rocks, Arch dams, Gravity dams, *Dam foundations, Faults (Geology), Rock pro-perties, Geology, Stress, Economics, Geologic investigations, Rock foundations, Rock mechanics, Bibliographies, Stress analysis. Identifiers: Geomechanics, India, Stress distribu-tion, Ontime design

tion. Optimum design. Dam stability.

In calculating stresses in a gravity, arch, or but-tress dam, the foundation is usually assumed as elastic and homogeneous. The gravity analysis for a gravity dam assumes a solid rock continuum, which is far from reality. Studies show that the nature of foundation rock substantially affects dam avior and internal stress distribution. The dam and foundation can be considered as a highly in-determinate entity capable of adjusting to circum-stances different from calculated assumptions. Studies discussed emphasize the need for detailed geological investigations. Stresses in the rock and the concrete structure can be calculated accurately only after precise determination of the geomechanical anisotropics of the rock mass. The location and orientation of seams and faults substantially affect the stress pattern in a dam. A fault in one position may be disastrous for the structure, whereas a similar weakness in a different position may be quite innocuous. Overconsolida foundations, apart from increasing costs, is not necessarily correspondingly beneficial. Decipher-ing dam geology precisely and accurately is essen-tial to the economic design of a dam. (USBR)

8G. Materials

ANALYSIS OF THE SMALL-SCALE STRENGTH TESTING OF ICE, Massachusetts Inst. of Tech., Cambridge. Sea For primary bibliographic entry see Field 02C. W73-07275 Grant Project Office.

STANDARDS FOR PLASTIC PIPING. Plastics Pipe Inst., New York.

Technical Report PPI-TR5-June 1970, 9 p 5 ap-

Descriptors: *Plastic pipes, Plastic deformation, Plastics, Pipes, Viscous flow, Elasticity (Mechani-cal), *Materials, *Specifications, *Standards, Plastics, Pipes, viscous now, Elastics, viscous, cal), "Materials, "Specifications, "Standards, Resins, Fatigue (Mechanics).

Identifiers: Viscoelastic phenomenon, Impact

Standards are given which may be used as a basis for procurement or identification of high qua plastic piping components. Component specifica-tions, methods of test, and recommended practions, methods of test, and recommended practices for pipe, tubes, conduit, fittings and related products made of plastics are given; standards for both thermo- and thermoset plastics are included. Also included is a list of technical reports prepared and issued by the Plastics Pipe Institute which may be obtained by writing the publisher. Most of the product standards given are intended to define recoducts of quality: the requirement value. products of quality; the requirement usually can not be used for engineering design criteria. Such criteria are covered in recommended practices, codes, model codes, installation procedures, separate reports, and the appendices of some of these product standards. Standards of both the American National Standards Institute and the American Society for Testing and Materiand the American Society for Testing and Materials are incorporated. In addition, separate appeadices describe various plastics used in piping, three major resins used, the viscoelastic phenomenon, fatigue in plastic pipe, and impact strength of plastic pipe. (Smith-NWWA) THERMOPLASTIC PIPING FOR POTABLE WATER DISTRIBUTION SYSTEMS, National Research Council, Washin Building Research Advisory Board.

Federal Construction Council Task Group T-52, Technical Report No. 61, National Academy of Sciences, Washington, D.C., 1971. 52 p 3 fig 3 ap-

Descriptors: *Plastic pipes, Plastics, Pipes, Materials, Materials testing, Specifications, *Standards, Construction, *Water distribution (Apdards, Construction, *Water distribution (Apdards, Construction) ed), Federal government, Elasticity (Mecha cal), Expansion. Identifiers: Thermoplastics, Polyvinyl chloride.

The two main groups of synthetic organic high polymers that are plastic or formable at some stage are the thermoplastic and the thermosetting types. The thermoplastic materials consist of long molecular chains held together by proximity molecular chains held together by proximity forces which decrease with temperature increases and are responsible for the material's ability to be melted to liquid form with the application of heat as well as its ability to be reformed into solids with the removal of the heat. Piping made of themplastic materials intended for use in water mains, water service lines, and building water distribution systems for all types of structures except those used primarily for high hazard and industrial occupancy is discussed. Criteria are presented which federal construction agencies can use in determining the suitability of thermoplastic piping for use in potable water distribution systems and to provide guidance for the design and installation of thermoplastic piping. (Campbell-NWWA) of thermopi W73-07344

RECOMMENDED STANDARDS FOR PREPARATION OF WATER WELL CON-STRUCTION SPECIFICATIONS,
Minnesota Water Well Association, St. Paul.
For primary bibliographic entry see Field 08A. W73-07345

ELECTROCHEMICAL ASPECTS OF STRESS CORROSION OF STEELS IN ALKALINE SOLU-

TIONS, Central Electricity Generating Board, Leather-head (England). Central Electricity Research

G. J. Bignold. Corrosion, Vol 28, No 8, p 307-312, August, 1972. 3 fig, 1 tab, 27 ref.

Descriptors: *Corrosion, Stress, Alkalinity, Steel, *Cracks, *Theoretical analysis, Mathematical stu-dies, Electrochemistry, Anodes, Nucleation. Identifiers: *Stress corrosion cracking, Alkaline solutions, Polarization, Caustic solutions, Current (Electrical), Potential (Electrical).

The existing theories of initiation and propagation of stress corrosion cracking (SCC) are examined with particular reference to their applicability to steels in caustic solutions. The electrochemical theory which considers cracking to be due to local active dissolution at the crack tip, and passivation of the walls, is developed into a model which explains the observed potential dependence of cracking rate and aspect ratio, and the existence of an anodic potential above which cracking ceases. The current distribution during stress corrosion at the rest potential is calculated, and it is shown that the cathodic current, unlike the anodic current, is not highly localized. The efficacy of anodic and cathodic polarization of a stress corrosion specimen is also examined, and it is shown that anodic control can be effective at the crack tip, whereas cathodic control only exists near the mouth of the crack. (Campbell-NWWA)

STRESS CORROSION CRACKING OF CARBON STEEL IN CARBONATE SOLUTIONS, Newcastle-upon-Tyne Univ. (England). Dept. of Metallurgy. J. M. Sutcliffe, R. R. Fessler, W. K. Boyd, and R.

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on, Vol 28, No 8, p 313-320, August, 1972. 13 fig. 12 ref.

Descriptors: *Corrosion, Stress, Steel, *Cracks, Carbonates, Stress analysis, Strain, Strain measurement, Ammonium compounds, Theoretical analysis, Microscopy. Identifiers: *Stress corrosion cracking, *Carbonate solutions, Inter-granular stress corrosion, Polarization, Potential (Electrical).

From observations of the characteristics of nitrate and hydroxide solutions known to promote stress corrosion cracking (SCC) in carbon steels, and from the form of potentio-dynamic polarization curves and the structural dependence of the corrosive attack, it was predicted that carbonate solutions would also produce intergranular stress corrosion in carbon steels. Constant strain rate stress corrosion tests, with some supplementary concerns of the stress with some supplementary concorrosion tests, with some supplementary con-stant strain and constant load tests, have shown that intergranular cracking can be made to occur in certain ranges of electrode potential in carbonate solutions over a wide range of concentrations and temperatures with NH4, Na, or K as the cation. temperatures with NH4, Na, or K as the cation. The range of potentials for cracking, which varies with solution composition and temperature, is shown to coincide with that range in which polarization curves obtained at different sweep rates indicated marked anodic activity and strong passivating tendencies. At more negative potentials than those that promote intergranular cracking, superficial transgranular fissuring is first detected and then, as the potential is moved toward even more negative values, a progressive loss in ductility is observed due to hydrogen entry into the steel. (Smith-NWWA) W73-07355

PREDICTING CORROSION RATES WITH THE

POTENTIOSTAT, International Nickel Co., Inc., Huntington, W. Va.

P. E. Morris, and R. C. Scarberry. Corrosion, Vol 28, No 12, p 444-452, December, 1972. 11 fig, 6 tab, 9 ref.

Descriptors: *Corrosion, Alloys, Electrochemistry, Sufuric acid, *Testing procedures, Electrodes, Current meters, *Graphical analysis, Materials testing.

Identifiers: Potential (Electrical), *Corrosion rate,

Polarization

Most corrosion processes are electrochemical in Most corrosion processes are electrochemical in nature, and in recent years increasing emphasis has been placed on electrochemical test methods. A new technique is described for using potentiostatically determined polarization curves which fulfills the requirements of a rapid electrochemical corrosion test. The test method makes use of the recently developed rapid-scan potentiodynamic technique to produce a series of polarization curves that describe an alloy's corrosion characteristics in the test environment. The method has curves that describe an alloy's corrosion characteristics in the test environment. The method has yielded calculated corrosion rates that correspond to rates obtained from conventional long-term imersion tests. It was indicated that the procedure for determining a Corrosion Behavior Diagram (CBD) forces a test electrode to display behavior most like the average behavior of a freely corroding electrode. For prediction of corrosion rates in sulfuric acid, the CBD has optimum sensitivity for alloys with good to moderate resistance to the solution. Research is continuing on the CBD as a general test method; there are indications that the CBD will find application for a wide range of alloys in a variety of media. (Campbell-NWWA) W73-07360 EVALUATION OF HAZARDS AND CORRO-SION OF BURIED WASTE LINES IN NA-TIONAL REACTOR TESTING STATION SOILS, Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office. For primary bibliographic entry see Field 05B. W73-07775

8H. Rapid Excavation

A SELECTED ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS. Division of Peaceful Nuclear Explosives (AEC), Washington, D.C. For primary bibliographic entry see Field 05B. W73-07763

A SELECTED, ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIEN-TIFIC USES FOR NUCLEAR EXPLOSIONS. Technical Information Center (AEC), Oak Ridge,

For primary bibliographic entry see Field 05B. W73-07764

EVALUATING THE HAZARDS OF GROUND-WATER CONTAMINATION BY RADIOACTIVI-TY FROM AN UNDERGROUND NUCLEAR EX-

PLOSION, California Univ., Livermore. Lawrence Livermore Lab. For primary bibliographic entry see Field 05B.

8I. Fisheries Engineering

PREPARATION OF FODDER PLANKTON FOR FEEDING FISH, (IN RUSSIAN), P. V. Mikheev, and I. V. Mikheeva. Sb Nauchno-Issled Rab Vses Nauch

Prud Rybn Khoz. 4 p 185-188. 1970. English sum-

Identifiers: *Fish diets, *Zooplankton, Feeding, Fish, Fodder, Preparation.

A new means of preparing zooplankton for feeding juvenile fish in live retainers and basins is proposed. It consists of careful interspersion of zooplankton with melted agar-agar in specific pro-portions. The fish consume either pieces of con-gealed agarized plankton mass or granules prepared from it.—Copyright 1972, Biological Ab-stracts, Inc.

CHARACTERISTICS OF GRASS CARP MATU-RATION IN PONDS IN UKRAINE, (IN RUS-SIAN), V. A. Prikhod'ko, and A. M. Pistun.

Rybn Khoz Resp Mezhved Temat Nauchn Sb. 12. p 70-74. 1971.

Identifiers: *Fish establishment, *Fish reproduc-tion, Carp, Fisheries, Maturation, Ponds, *Ukraine, USSR.

Sexual maturation of grass carp first brought to the Ukraine and raised in the 'Nivka' fishery is discussed. Sexual maturity is attained in the 9th yr of life. Offspring of these fish matured in ponds of the Tsuryupinskoe spawning-breeding industry during the 5th yr of life. As an object of acclimatization the grass carp responded to new condition by maturing earlier.—Copyright 1972, Biological Abstracts, Inc. W73-07372

ELEMENTS OF NITROGEN BALANCE AND FOOD RATIONS IN SILVER CARP UNDERYEARLINGS, (IN RUSSIAN),

T. S. Kopylova.

Tr Vses Nauchno-Issled Inst Prudovgo Rybn
Khoz. 18: p 100-104, 1971. (English summary).
Identifiers: Food, "Nitrogen, Rations, "Silver
Carp, "Carp underyearlings, Fish Diet.

A sharply pronounced selectivity toward food objects was observed in the diet of silver carp underyearlings. With the transfer to feeding on detritus good use was made of detrital N for the production of body protein. The value of the productive protein effect was 42.9%, energy expenditure 46.2% and the non-anabolic portion was 10.9%. Intensive use of N during a 24 hr period equalled 16.7% of body N; the dietary ration was 46.4% of body weight.—Copyright 1972, Biological Abstracts, Inc.

SOME DATA ON THE DIET OF BIGHRAD YEARLINGS DURING JOINT RAISING WITH CARP (IN RUSSIAN), E. V. Danchenko.
Tr Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 18: p 52-56. 1971. English summary. Identifiers: "Bighead yearlings, "Carp, Diet, Phytoplankton, Yearlings, "Zooplankton, Algae.

The bighead has a wide dietary spectrum. It includes representatives from the main groups of zooplankton and algae. Though the biomass of pond plankton consists of 70-80% phytoplankton, the bighead selects zooplankton. The bighead will eat phytoplankton only in ponds where the residual biomass of zooplankton is very small. In this case it prefers the larger forms and increased its use of detritus. The degree of correlation between the food of carp and that of the bighead increases during the second half of summer when carp are converted to eating zooplankton.—Copyright 1972, Biological Abstracts, Inc.

W73-07472

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10C. Secondary Publication And Distribution

INDEXED BIBLIOGRAPHY OF NUCLEAR DESALINATION LITERATURE-7, Oak Ridge National Lab., Tenn. Nuclear Desalination Information Center.
For primary bibliographic entry see Field 03A. W73-07273

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EXPLORATION AND EXPLOITATION OF GEOTHERMAL RESOURCES IN ARID AND SEMILARD LANDS, A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY. Arizona Univ., Tucson. Office of Arid Lands Stu-

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION

Group 10C—Secondary Publication And Distribution

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Office of Water Resources Research, Washington,
D.C. Water Resources Scientific Information Center. For primary bibliographic entry see Field 06A.

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A SELECTED ANNOTATED BIBLIOGRAPHY OF THE CIVIL, INDUSTRIAL, AND SCIENTIFIC USES FOR NUCLEAR EXPLOSIONS.
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For primary bibliographic entry see Field 05B.

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A	EC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W73-07756 07758 07760 07785	29
A	merican Water Works Association Research Foundation, Water Treatment Plant Waste Pollution Control	W73-07444	1
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U	Iniversity of North Carolina, Metropolitan Water Resources Planning and Management	W73-07175 - 07179 07690 - 07695	1
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В.	State Water Resources Research Institutes		
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	Idaho Water Resources Research Institute	W73-07152	1
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	Kansas Water Resources Research Institute	W73-07720	1
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- ► Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- ► Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- ▶ Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- ▶ Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- ▶ Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- ► Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- ▶ Water well construction technology at the National Water Well Association.
- ▶ Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- ▶ Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- ▶ Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- ▶ Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- ▶ Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- ▶ Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- ▶ Water treatment plant waste pollution control at American Water Works Association.
- ► Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields NATURE OF WATER LIBRAR WATER CYCLE DEPARTMENT OF COMMERCE PACIFIC POWER & LIGHT WATER SUPPLY AUGMENTATION AND CONSERVATION COMPANY COM 211 WATER QUANTITY MANAGEMENT AND CONTROL WATER QUALITY MANAGEMENT 5 AND PROTECTION

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